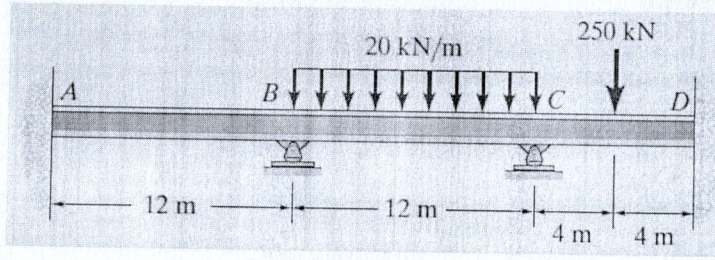
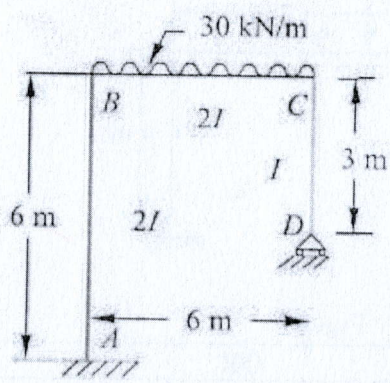


<b>Course Code: SOE-B-CE501</b>		
<b>O P JINDAL UNIVERSITY</b>		
<b>B. Tech. V Semester Regular Examinations</b>		
<b>Theory of Structures – II</b>		
(Offered to CE)		
<b>Time: 03 Hrs.</b>	<b>Max. Marks: 100</b>	
Answer any one question from each unit		
All questions carry equal marks		
	<b>M</b>	<b>CO</b>
	<b>KL</b>	

**Unit-I (20 marks)**

1	<p>Determine the internal moments at each support of the beam ABCD shown in Figure 1. Take EI as constant. Use moment distribution method. Sketch the bending moment diagram (BMD).</p> <div style="text-align: center;">  <p>Figure 1</p> </div>	20	1	IV
<b>OR</b>				
2	<p>Using moment distribution method, analyze the frame ABCD shown in Figure 2. Draw BMD.</p> <div style="text-align: center;">  <p>Figure 2</p> </div>	20	1	IV

**Unit-II (20 marks)**

3	<p>Analyze the continuous beam as shown in below by the strain energy method. Sketch BMD. Take E as constant.</p>	20	3	IV
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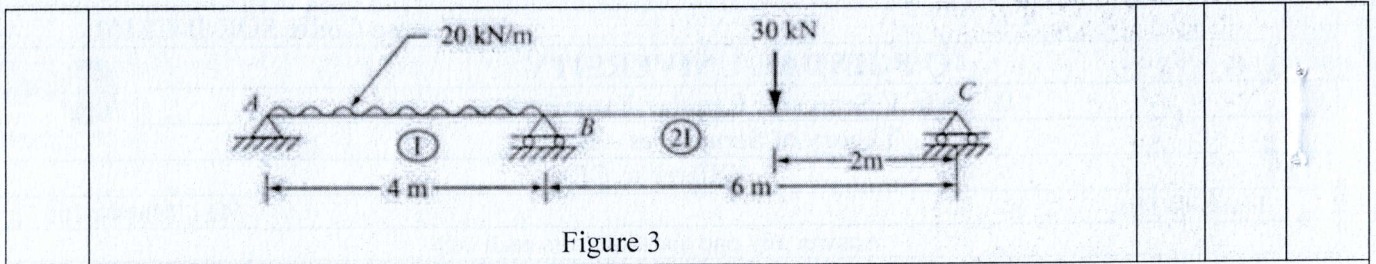


Figure 3

OR

4 Analyze the frame shown in Figure 4 using strain energy concept. Take  $EI$  as constant. Length of BC is 6 m. Draw BMD

20 3 IV

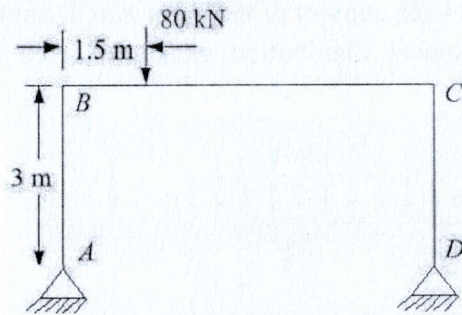


Figure 4

**Unit-III (20 marks)**

5 Using consistent deformation method, find the reaction components in the frame shown in Figure 5. Draw BMD.

20 3 IV

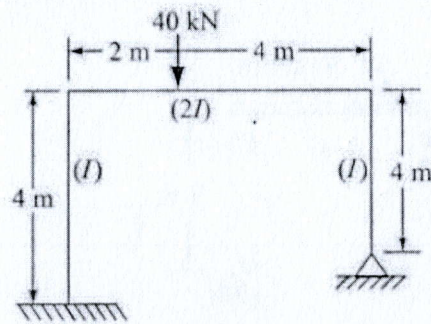


Figure 5

OR

6 Using three moment theorem, analyze the continuous beam ABC as shown in Figure 6, if the support B sinks by 20 mm. Take  $E = 200 \text{ GPa}$  and  $I = 1 \times 10^8 \text{ mm}^4$ . Draw BMD.

20 3 IV

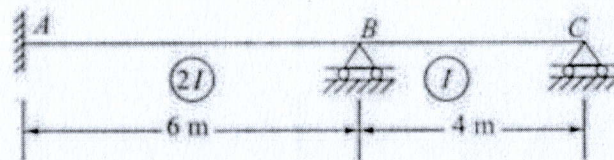


Figure 6



**Unit-IV (20 marks)**

7	Using column analogy method, find out the end moments for beam AB, as shown in Figure 7. Take E as constant. Draw BMD	20	1	IV
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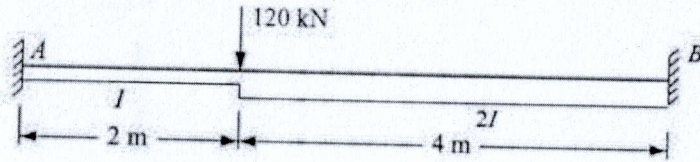


Figure 7

**OR**

8	Analyze the continuous beam shown in Figure 8 by slope deflection method and draw BMD. Take E as constant.	20	1	IV
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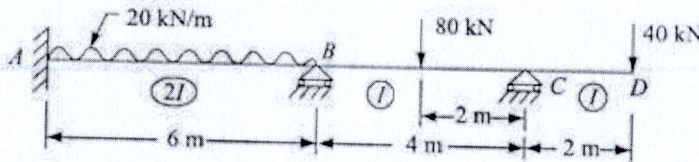


Figure 8

**UNIT-V (20 marks)**

9	Compute the influence line diagram for moment at mid-span of span BC for the ABC beam shown in Figure 9, at an interval of 1 m and draw the influence line diagram. Assume moment of inertia to be constant throughout.	20	2	IV
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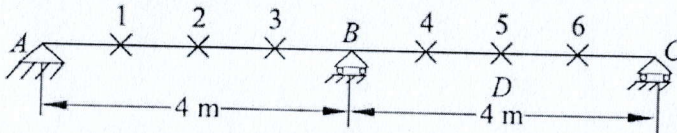


Figure 9

**OR**

10	Using Muller-Breslau principle, calculate the influence line ordinates at 2 m interval for vertical reaction at B and C of the beam shown in Figure 10.	20	2	IV
----	---	----	---	----

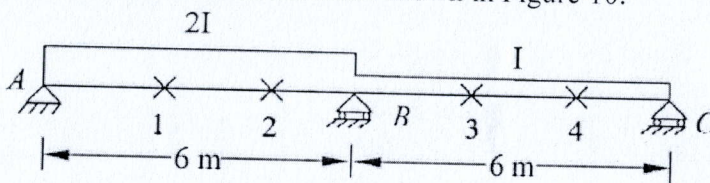


Figure 10

**Note:** If any data missing, then assume it and mention it at the beginning of your answer. Good Luck!!!!

\*\*\*\*\*







Course Code: SOE-B-CE502

**O P JINDAL UNIVERSITY**  
**III B. Tech. V Semester Regular Examinations**  
**STRUCTURAL ENGINEERING DESIGN-I**  
 (Offered to Civil Engineering)

Time: 4 Hrs.

Max. Marks: 100

Answer any one question from each unit  
 All questions carry equal marks  
**Note: IS 456:2000 allowed only.**  
**Each questions carries 20 Marks.**

		M	CO	KL	
<b>Unit-I (20 marks)</b>					
1	a.	Write down the assumptions made for working stress method and derive the equations for 'n', 'k', 'j', 'R' and 'M <sub>r</sub> '?	10	1	1
	b.	Derive the equation for balanced, under-Reinforced and over-Reinforced section for WSM and derive the equations for equivalent section?	10	1	5
<b>OR</b>					
2	a.	An R.C.C beam 300mm x 640mm overall is reinforced with 4 bars of 20mm diameter. The beam has to carry a superimposed load of 50 kN/m, including the self-weight of the beam, over an effective span of 5m. Find the actual stresses developed in steel and concrete. The effective cover is 40 mm. Take $m = 13.33$ . Also find the compressive stress in concrete at 50 mm from top of the beam and draw bending stress diagram?	8	1	6
	b.	Write down the necessity of double RC beam and derive expression for Equivalent section, critical neutral axis, actual neutral axis, moment of resistance for doubly RC beam (WSM)?	12	1	2, 5
<b>Unit-II</b>					
3	a.	Derive in details equation for balanced, under- reinforced and over-reinforced sections by LSM (singly RC Beam)?	8	2	5
	b.	A rectangular RC beam is simply supported on two masonry walls 250 mm thick and 6 m apart (center to center). The beam is carrying an imposed load of 15 kN/m <sup>2</sup> . Design the beam with necessary checks. Use M30 concrete and Fe415 steel. (Detailing of reinforcement needed).	12	2	6
<b>OR</b>					
4	a.	Analyze the doubly RC beam and find out depth of neutral axis, moment of resistance and determine the factored moment of resistance of beam 230mm x 460mm (effective). The beam is reinforced with 2-16mm diameter bars on compression side and 4-20mm diameter bars on tension side. The compression bars are placed at a distance of 40mm from top. Use M20 concrete and F415 Steel.	12	2	4,6



	b.	Design a rectangular beam 230mm x 600mm over an effective span 5m. The superimposed load on the beam is 50 kN/m. Effective cover to reinforcement is taken as 50mm. Use M20 concrete and Fe415 steel.	8	2	6
<b>Unit-III</b>					
5	a.	Design a simply supported R.C.C roof slab for room 3m x 7m clear dimensions. The thickness of supporting wall is 300mm. The slab carries 75mm thickness flooring of unit weight 20 kN/m <sup>2</sup> the slab is carrying a live load of 2 kN/m <sup>2</sup> . Use M20 concrete and Fe415 steel.	15	3	6
	b.	Explain difference between one way slab and two-way slab in details?	5	3	2
<b>OR</b>					
6	a.	Design a R.C.C slab for a room of clear dimensions 6.5m x 5m. The slab is cast monolithically over the beams with corners held down. The width of the supporting beam is 230mm. The slab carries superimposed load of 5 kN/m <sup>2</sup> . Use M20 concrete and Fe500 steel.	12	3	6
	b.	Design simply supported slab for a room measuring 6.5m x 5.2m. The width of support is 250mm with corners free to lift. The slab carries superimposed load of 3 kN/m <sup>2</sup> . Use M20 concrete and Fe250. Cover of 20mm.	8	3	6
<b>Unit-IV</b>					
7	a.	Explain the classification of column based on cross section, type of loading and slenderness ratio? Design a short R.C.C. column to carry an axial load of 1600 kN. It is 4m long effectively held in position and restrained against rotation at both ends. Use M20 concrete and Fe415 steel.	12	4	5,6
	b.	Determine the bending capacity $M_u$ for a column size 300mm x 500mm which is reinforced with 6 bars of 20mm diameter bars arranged on two sides of the column if it is subjected to an axial load of 800 kN. Use M20concrete and Fe415 steel. Take $d' = 50$ mm.	8	4	5,6
<b>OR</b>					
8	a.	Design the reinforcement to be provided for a short column 400mm x 500mm subjected to following forces; $P_u = 1600$ kN, $M_{ux} = 200$ kNm, $M_{uy} = 150$ kNm. Use M20 concrete and Fe415 steel.	10	4	6
	b.	Design a circular column of diameter 450mm subjected a load of 1200 kN. The column is having spiral ties. The column is 3m long and is effectively held in position at both ends but not restrained against rotation. Use M25 concrete and Fe415 steel.	10	4	6
<b>UNIT-V</b>					
9	a.	Design a dog legged staircase for residential building of size 2.1m x 4.48m between centers of supports. The columns are of size 230mm x 230mm. The width of the beam and thickness of the supporting wall is 230mm. The floor-to-floor height is 3.2m. Live load on the staircase 3 kN/m <sup>2</sup> and floor finish of 1 kN/m <sup>2</sup> use M20 concrete and Fe415 steel.	15	4	6

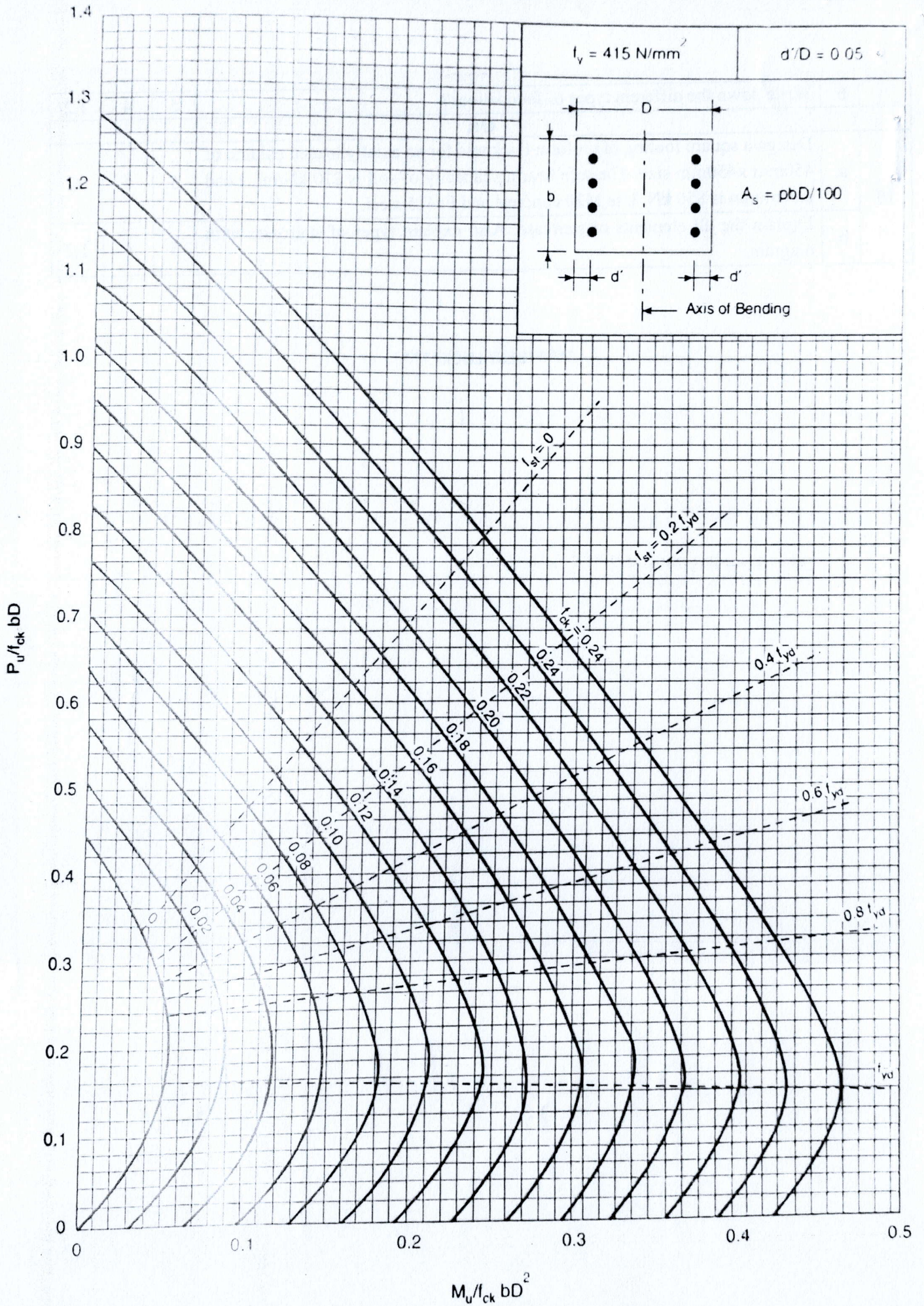


	b.	Write down the different types of foundations?	5	4	1,2
<b>OR</b>					
10	a.	Design a square footing of uniform thickness for an axially loaded column of 450mm x450mm size. The safe bearing capacity of soil is 210 kN/m <sup>2</sup> . Load on column is 850 kN. Use M20 concrete and Fe415 steel.	5	4	6
	b.	Explain the all elements of staircase. Also explain types of staircases with diagram.	5	4	1,2

\*\*\*\*\*BEST LUCK\*\*\*\*\*

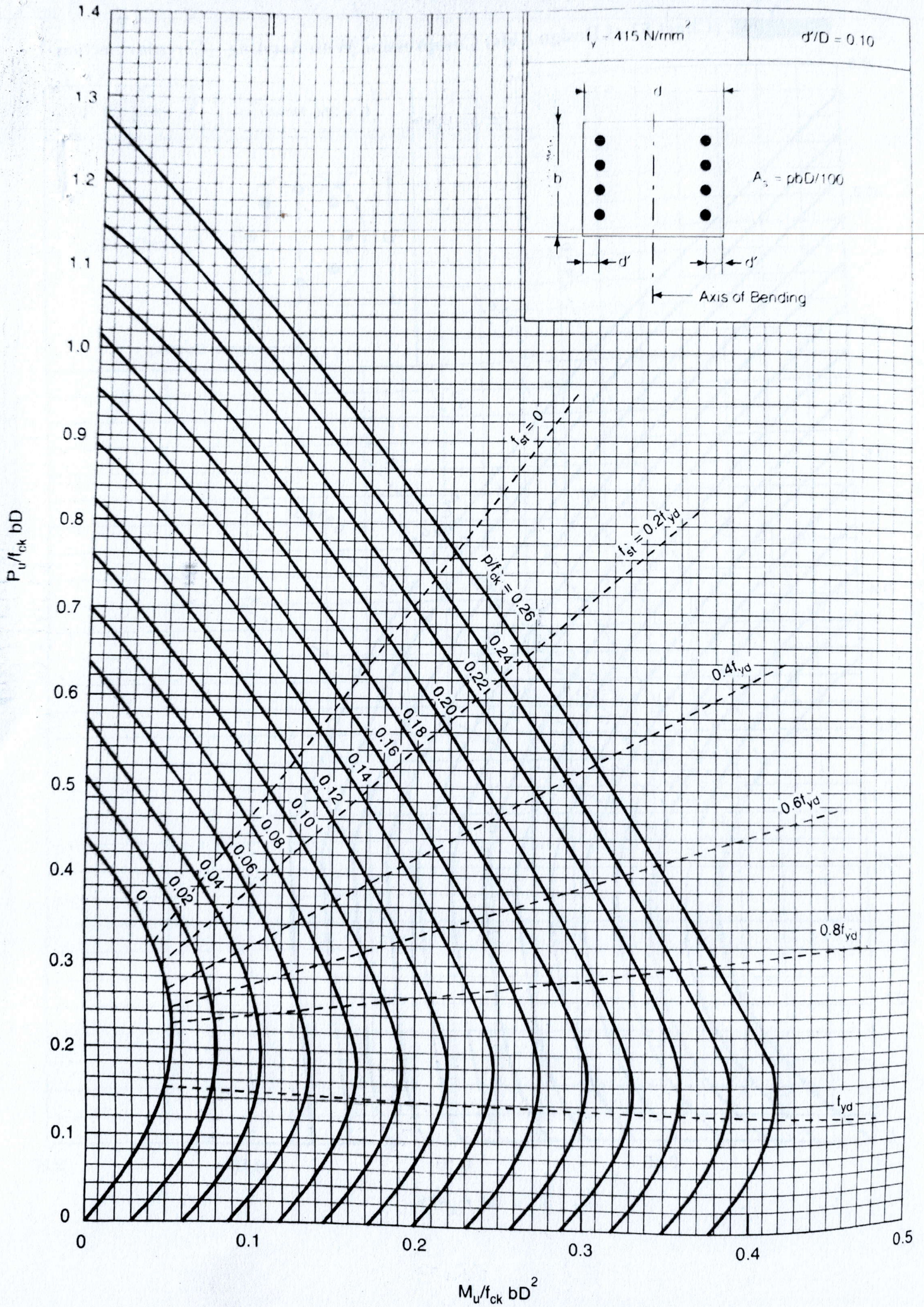


(Chart 31 of Design Aids) Compression With Bending—Rectangular Section—Reinforcement Distributed Equally on Two Sides



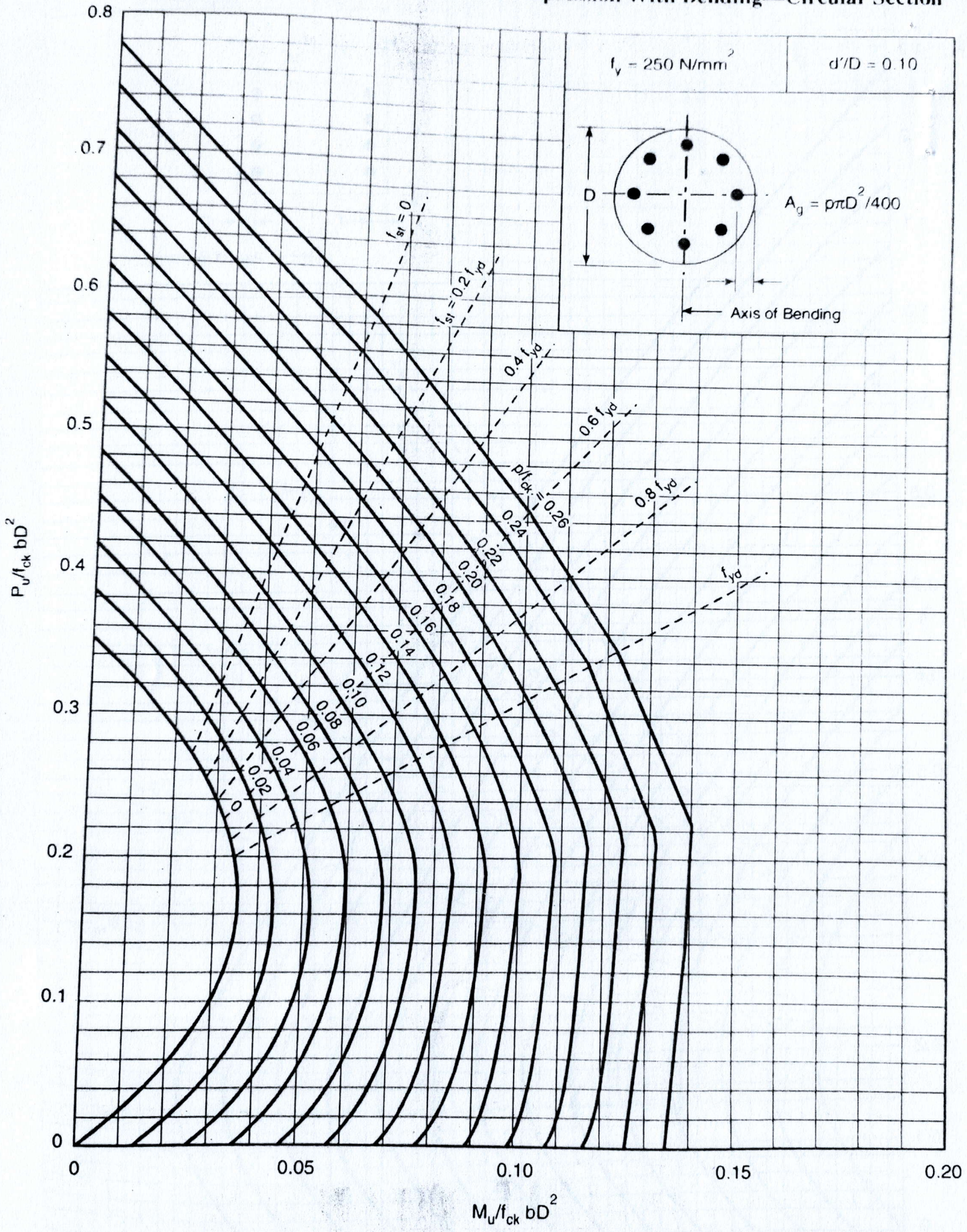


(Chart-32 of Design Aids) Compression With Bending—Rectangular Section—Reinforcement Distributed Equally on Two Sides



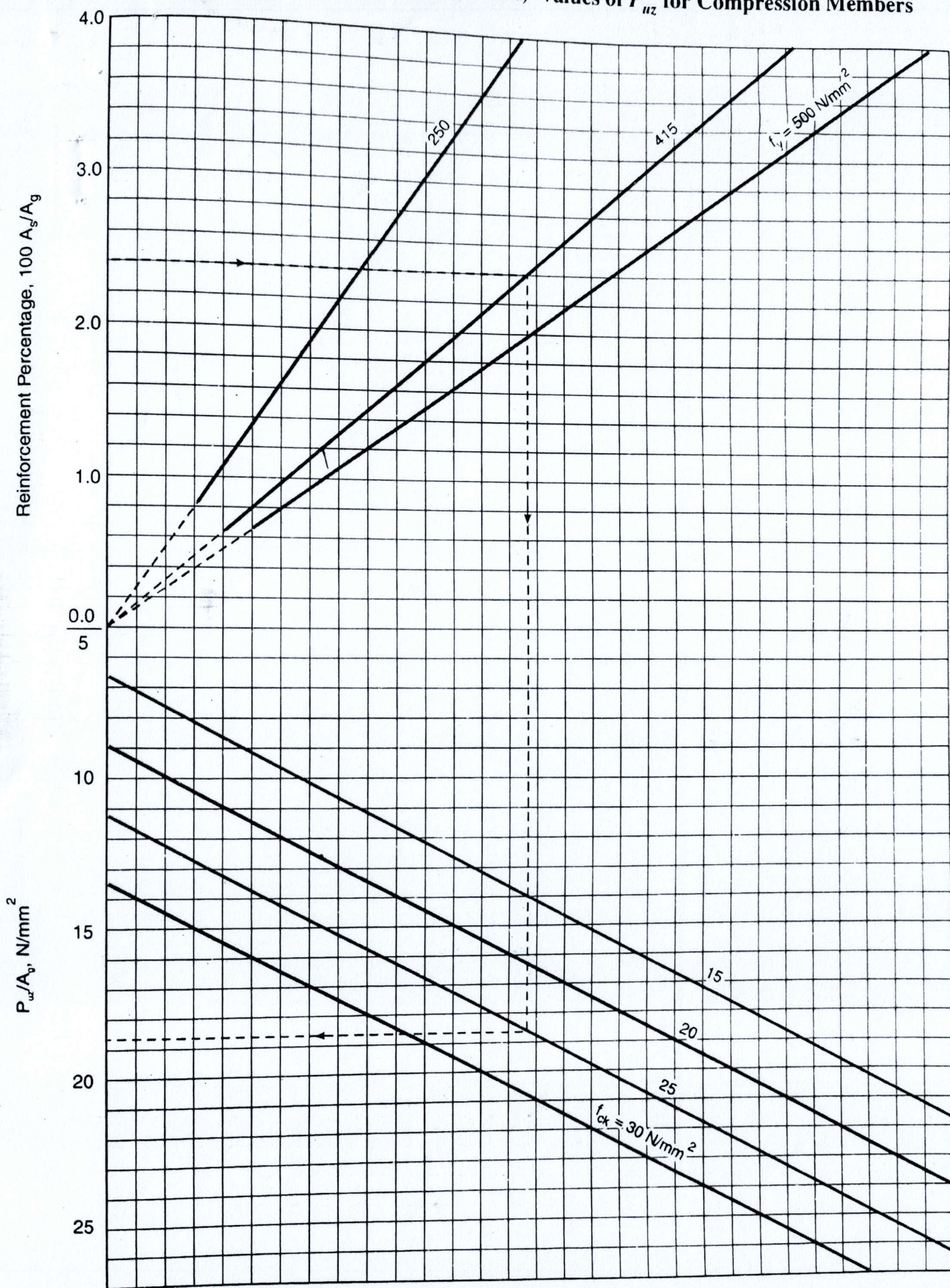


(Chart 52 of Design Aids) Compression With Bending—Circular Section





(Chart 63 of Design Aids) Values of  $P_{uz}$  for Compression Members









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09

<b>Course Code: SOE-B-CE503</b>	
<b>O P JINDAL UNIVERSITY</b>	
<b>B. Tech. V Semester Regular Examinations</b>	
<b>Geo-technical Engineering I</b>	
<b>(Offered to Civil Engineering)</b>	
<b>Time: 3 Hrs.</b>	<b>Max. Marks: 100</b>
Answer any one question from each unit	
All questions carry equal marks	

		M	CO	KL	
<b>Section-A</b>					
1	a.	What is quick sand condition?	2	2	2,3
	b.	What is difference between permeability and seepage?	2	2	1,2
	c.	Define compressibility of soil.	2	3	2,4
	d.	What is over consolidation ratio (OCR)?	2	3	1,2
	e.	Define seepage pressure.	2	2	2,4
	f.	What is Lacustrine Soil?	2	1	1,2
	g.	What is relative density of sand?	2	1	2,4
	h.	What is $C_u$ and $C_c$ of soil?	2	1	4,5
	i.	What are different methods for determination of the coefficient of the permeability in a laboratory ?	2	2	5
	j.	What is Phreatic line?	2	2	1,2
<b>Section-B:</b>					
<b>Unit-I</b>					
2	a.	Define the terms void ratio, specific gravity, degree of saturation and dry density.	8	1	4,5
	b.	A moist soil sample weight 3.52N. After drying in an oven its weight is reduced to 2.9N. The specific gravity of solids and the mass specific gravity are respectively 2.68 and 2.13. Determine the water content, void ratio, porosity and degree of saturation. Take unit weight of water is $10 \text{ kN/m}^3$ .	8	1	4,5
<b>OR</b>					
3	a.	What do you understand by consistency of soil? How is it determined?	8	1	2,5
	b.	(i) Describe rock cycle with a pictorial diagram. (ii) How would you determine the percentage finer than different sieve sizes in the laboratory?	8	1	2,4,5
<b>Unit-II</b>					
4	a.	(i) How to prevent piping failure in dam? (ii) What is a flow net?	8	2	3,4,5



	b.	(i) Write assumptions of Laplace two dimensional equation of flow. (ii) What is critical hydraulic gradient?	8	2	2,5													
<b>OR</b>																		
5	a.	(i) In a constant head permeameter test ,the following observations were taken . Distance between piezometer tapping = 100mm, Difference of water levels in a piezometer = 60mm Diameter of test samples=100mm Quantity of water collected = 350ml Duration of the test = 270 Sec Determine the coefficient of permeability of the soil. (ii) The falling -head permeability test was conducted on a soil sample of 4cm diameter and 18 cm length .The head fell from 1.0m to 0.40m in 20 minutes.If the cross-sectional area of the stand pipe was 1 cm <sup>2</sup> , determine the coefficient of permeability.	8	2	4,5													
	b.	(i) Determine the average coefficient of permeability in the horizontal and vertical directions for a deposit consisting of three layers of thickness 5m,1m and 2.5m and having the coefficient of the permeability of 3x10 <sup>-2</sup> mm/sec, 3x10 <sup>-5</sup> mm/sec, and 4x10 <sup>-2</sup> mm/sec respectively.Assume the layers are isotropic. (ii)Discuss the factors those are affecting permeability.	8	2	4,5													
<b>Unit-III</b>																		
6	a.	The following results were obtained from standard compaction test on a soil sample.The volume of the mould used was 950 ml.Make necessary calculations and plot the compaction curve and obtain the maximum dry density and optimum water content. Also calculate the void ratio,degree of saturation and the theoretical maximum dry density.(G=2.70)	8	3	4,5													
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">Water Content (%)</td> <td>0.12</td> <td>0.14</td> <td>0.16</td> <td>0.18</td> <td>0.20</td> <td>0.22</td> </tr> <tr> <td>Mass of wet soil (kg)</td> <td>1.68</td> <td>1.85</td> <td>1.91</td> <td>1.87</td> <td>1.87</td> <td>1.85</td> </tr> </table>		Water Content (%)	0.12	0.14	0.16	0.18	0.20	0.22	Mass of wet soil (kg)	1.68	1.85	1.91	1.87	1.87	1.85		
Water Content (%)	0.12	0.14	0.16	0.18	0.20	0.22												
Mass of wet soil (kg)	1.68	1.85	1.91	1.87	1.87	1.85												
	b.	What are the different methods of compaction adopted in the field?How would you select the type of roller to be used?	8	3	2,3													
<b>OR</b>																		
7	a.	What is a compaction curve? Give its salient features .What is a zero void line?	8	3	2,4													
	b.	(i) Differentiate between primary consolidation and secondary consolidation. (ii) Differentiate between normally consolidated soil and over consolidated soil.	8	3	1,2													
<b>Unit-IV</b>																		
8	a.	(i) What is the mechanism of shearing resistance of soil? (ii)What is shear strength of soil?Write down the formula.	8	4	2,3, 4,5													
	b.	Describe direct shear test with proper diagram.	8	4	1,2													
<b>OR</b>																		
9	a.	What is liquefaction of the soil? Write down its effect.	8	4	2,4													



	b.	Describe triaxial test with proper diagram.	8	4	1,2
<b>UNIT-V</b>					
10	a.	(i) Write primary objective of soil exploration. (ii) What do you mean by boring? Write different types of boring process.	8	5	1,2
	b.	(i) Write difference between disturb and undisturb soil samples. (ii) Write difference between static cone penetration test and dynamic cone penetration test.	8	5	1,2, 5
<b>OR</b>					
11	a.	Describe Standard Penetration Test (SPT) with diagram.	8	5	1,2
	b.	Describe the wash boring process with diagram.	8	5	1,2

**Best of Luck**







Course Code: SOE-B-CE504

**O P JINDAL UNIVERSITY**

III B. Tech. V Semester Regular Examinations

**TRANSPORTATION ENGINEERING II**

(Offered to Civil Engineering)



Time: 3 Hrs.

Max. Marks: 100

Answer any one question from each unit

All questions carry equal marks

M	CO	KL
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**Section-A( Solve all questions)**

Q.1	a.	What are different mod of transportation	2	CO1	KL1
	b.	Define supported rail joint and bridge joint	2	CO2	KL1
	c.	What is the functions of sleeper and ballast	2	CO2	KL1
	d.	Define negative super elevation	2	CO2	KL1
	e.	Describe widening of gauge on curve.	2	CO2	KL1
	f.	What is fuction lining in tunnels	2	CO3	KL1
	g.	What do you mean by afflux	2	CO3	KL1
	h.	Define scour depth	2	CO3	KL1
	i.	What are the objects of providing jetties and wharves.	2	CO4	KL1
	j.	What are the classification of harbours	2	CO4	KL1

**Section-B: (Solve any two from each unit)**

**Unit-I**

Q.2	a.	Explain the uniformity of gauges and also explain the advantages	8	CO2	KL2
	b.	Discuss different types of sleepers and state relative merits and demerits	8	CO2	KL2
	c.	What is the function of ballast? What are the types of it	8	CO2	KL2

**Unit-II**

Q.3	a.	What are the causes of creep? What are the effects of creep?	8	CO2	KL2
	b.	Discuss in detail about the various types of track junctions?	8	CO2	KL2



	c	Derive expression for equilibrium super elevation	8	CO2	KL2
<b>Unit-III</b>					
Q.4	a.	What is the necessity of railway tunnels? Also explain ventilation in tunnel.	8	CO3	KL2
	b.	Explain different types of tunnel section with advantages and disadvantages	8	CO3	KL2
	c	Explain method of tunneling in soft soil	8	CO3	KL2
<b>Unit-IV</b>					
Q.5	a.	What are the factors which governs the selection of site for bridges	8	CO3	KL2
	b.	Explain design data required for the construction of new bridge.	8	CO3	KL2
	c.	Explain loads acting on railway bridges	8	CO3	KL2
<b>UNIT-V</b>					
Q.6	a.	Explain points to be considered during site selection for harbor.	8	CO4	KL2
	b.	Write note on: a) Wharves      b) Dry and wet dock   c) Berthing	8	CO4	KL1
	a.	Write note on: a) Light house   b) Ware house      c) Breakwater	8	CO4	KL1



Course Code: SOE-B-CE505

**O P JINDAL UNIVERSITY**

**B. Tech. V Semester Regular Examinations, January 2023**

**SUBJECT: CONCRETE TECHNOLOGY**

(Offered to **CIVIL ENGINEERING**)



**Time: 3 Hrs.**

**Max. Marks: 100**

Answer any one question from each unit of section-B

Section-A is compulsory

**M CO KL**

**Section-A**

1	a.	Enumerate at least four chemical compositions of cement.	2	1	1,2
	b.	Define "Sulphate – Attack".	2	1	1,2
	c.	Define admixture.	2	4	1,3
	d.	What is meant by Bleeding on concrete.	2	3	2
	e.	Define "Modular -Ratio".	2	3	1
	f.	What is meant by permeability of concrete.	2	3	2
	g.	Write down the types of exposure condition for concreting.	2	2	5,6
	h.	If characteristics strength of concrete is 30MPa, standard deviation is 4MPa, Calculate the mean strength according to ACI method.	2	2	2,5
	i.	Write down the need of special concrete.	2	4	1,2
	j.	What do you mean by self-compacted concrete	2	4	1,2

**Section-B:**

**Unit-I**

2	a.	Write down the classification of cement explain each of them.	16	1	1,2
	b.	-----	0		

**OR**

3	a.	What is Alkali-Aggregate reaction write down factors promoting it.	6	1	1,2
	b.	Explain the hydration of cement.	10	1	2

**Unit-II**

4	a.	What is the utility of plasticizer and superplasticizer. Write down examples of each of them.	4	4	1,3
	b.	Write down the action of superplasticizer on cement. How does the optimum requirement of superplasticizer can be obtained.	12	4	1,3

**OR**

5	a.	Define workability. Write down factors affecting workability.	8	3	1,3
	b.	What is mineral admixture; explain the types of mineral admixture.	8	3	1,3

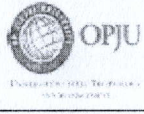
**Unit-III**

6	a.	Define Gel/space ratio . Calculate the gel/space ratio and theoretical strength of a sample of concrete made with 500gm of cement with 0.5 w/c ratio.	8	3	2,4
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		i) on full hydration. ii) on 60% hydration.				
	b.	Define shrinkage, write down it's type describe each of them.	8	3	2,4	
<b>OR</b>						
7	a.	Define durability. Write down factors affecting durability.	10	3	2,4	
	b.	What is creep. Write down factors affecting creep.	6	3	2,4	
<b>Unit-IV</b>						
8	a.	Perform mix proportioning for a concrete of M40 grade for given test data:	16	2	2,5, 6	
		1. Type of cement				PPC
		2. Maximum nominal size of aggregate				20mm
		3. Exposure condition				Severe
		4. Workability				75mm(slump)
		5. Method of concrete placing				Non-pumpable
		6. Type of aggregate				Crushed angular aggregate
		7. Maximum cement content				450kg/m <sup>3</sup>
		8. Sp. gravity of cement				2.8
		9. Sp. gravity of coarse aggregate				2.7
		10. Sp. Gravity of fine aggregate				2.6
		11. Water absorption of C.A.				0.5%
		12. Water absorption of F.A.				1%
	13. Air entraining	No				
	Assume any other data if required.					
	b.	-----	0			
<b>OR</b>						
9	a.	Explain different types of Non-destructive test on concrete.	16	2	2,4	
	b.	-----	0			
<b>UNIT-V</b>						
10	a.	Explain the types of polymer concrete with example.	8	4	1,4	
	b.	What is Light weight concrete explain its types.	8	4	1,4	
<b>OR</b>						
11	a.	Write down the effect of cold weather on concrete, write down the remedies adopted while cold weather concreting.	10	4	1,2, 4	
	b.	Explain vacuum dewatered concrete.	6	4	1,2, 4	



<b>Course Code: SOE-B-CE510</b>			
<b>O P JINDAL UNIVERSITY</b>			
<b>B. Tech. V Semester Regular Examinations</b>			
<b>Design Thinking (online)</b> (Offered to CE)			
<b>Time: 02 Hrs.</b>		<b>Max. Marks: 50</b>	
Answer any one question from each unit			
All questions carry equal marks			
			<b>M   CO   KL</b>

**Unit-I (10 marks)**

1	a.	What is Creativity?	3	2	I
	b.	Explain the creative problem solving process?	7	2	II
<b>OR</b>					
2	a.	What is meant by Brain storming?	3	2	I
	b.	Summarize are the characteristic of Brain storming?	7	2	II

**Unit-II (10 marks)**

3	a.	Explain the process of Project Planning Assessment.	10	2	II
<b>OR</b>					
4	a.	Write notes on Project Appraisal?	5	2	II
	b.	Write notes on Project Identification Steps?	5	2	II

**Unit-III (10 marks)**

5	a.	Define the terms a) research b) patent c) Intellectual Property d) IPR	10	2	I
<b>OR</b>					
6	a.	Write note on Copyright Infringement?	5	2	II
	b.	What is meant by Trademark Infringement?	5	2	I

**Unit-IV (10 marks)**

7	a.	Define Prototype. What are the characteristic features required for designing prototype product?	10	2	I
<b>OR</b>					
8	a.	What Makes Prototype Testing Valuable?	10	2	II

**UNIT-V (10 marks)**

9	a.	What are the steps in the engineering design process?	5	2	I
	b.	How to file a patent application?	5	2	I
<b>OR</b>					
10	a.	What types of inventions can be patented?	5	2	I
	b.	Comment on the Creative Process in 7 Steps?	5	2	II







Course Code: SOE-B-CE510

**O P JINDAL UNIVERSITY**

**B. Tech. V Semester Regular Examinations**

**Design Thinking (online)**

(Offered to CE)



**Time: 02 Hrs.**

**Max. Marks: 50**

Answer any one question from each unit

All questions carry equal marks

<b>M</b>	<b>CO</b>	<b>KL</b>
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**Unit-I (10 marks)**

1	a.	What is Creativity?	3	2	I
	b.	Explain the creative problem solving process?	7	2	II
<b>OR</b>					
2	a.	What is meant by Brain storming?	3	2	I
	b.	Summarize are the characteristic of Brain storming?	7	2	II

**Unit-II (10 marks)**

3	a.	Explain the process of Project Planning Assessment.	10	2	II
<b>OR</b>					
4	a.	Write notes on Project Appraisal?	5	2	II
	b.	Write notes on Project Identification Steps?	5	2	II

**Unit-III (10 marks)**

5	a.	Define the terms a) research b) patent c) Intellectual Property d) IPR	10	2	I
<b>OR</b>					
6	a.	Write note on Copyright Infringement?	5	2	II
	b.	What is meant by Trademark Infringement?	5	2	I

**Unit-IV (10 marks)**

7	a.	Define Prototype. What are the characteristic features required for designing prototype product?	10	2	I
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9	a.	What are the steps in the engineering design process?	5	2	I
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<b>OR</b>					
10	a.	What types of inventions can be patented?	5	2	I
	b.	Comment on the Creative Process in 7 Steps?	5	2	II

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10/05/23 12:00 PM 03/01/23  
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<b>Course Code: SOE-B-CSE501 (1)</b>																							
<b>O P JINDAL UNIVERSITY</b>			<b>R 19</b>																				
<b>III B. Tech. V Semester Regular Examinations</b>																							
<b>Course Name : Theory of Computation</b>																							
<b>Time: 3 Hrs.</b>	<b>Program Name : B.Tech.</b>	<b>Program Code : 01UG020</b>	<b>Max. Marks: 100</b>																				
Answer any one question from each unit																							
All questions carry equal marks																							
<b>Section-A</b>			<b>M CO KL</b>																				
1	a.	Define a one-to-one relation	2	CO5	K1																		
	b.	When a relation is said to be an equivalent relation ?	2	CO5	K1																		
	c.	Define $\delta$ in NFA with $\epsilon$ -Transition	2	CO2	K1																		
	d.	Define Moore Machine	2	CO2	K1																		
	e.	Define Language	2	CO1	K1																		
	f.	List out any three closure properties of regular language	2	CO1	K1																		
	g.	Right Linear Grammar	2	CO3	K1																		
	h.	Define PDA.	2	CO3	K1																		
	i.	State Russell's paradox.	2	CO4	K1																		
	j.	What is partial recursive sets.	2	CO4	K1																		
<b>Section-B:</b>																							
<b>Unit-I (16 marks)</b>																							
2	a.	If $f(x) = x/(x-1)$ , $x \neq 1$ then find fof.	8	CO5	K3																		
	b.	$1^3 + 2^3 + 3^3 + \dots + n^3 = n^2 (n+1)^2 / 4$	8	CO5	K3																		
<b>OR</b>																							
3	a.	Show that $A \cap (A \cup B) = A$	8	CO5	K3																		
	b.	Show that $2 + 6 + 10 + \dots + (4n - 2) = 2n^2$	8	CO5	K3																		
<b>Unit-II (16 marks)</b>																							
4	a.	Write difference between DFA and NFA	8	CO2																			
	b.	Show that union of regular language is regular	8	CO1																			
<b>OR</b>																							
5	a.	Construct the minimum state automata for the following <table border="1" style="margin: 5px 0; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">→A</td> <td style="text-align: center;">B</td> <td style="text-align: center;">C</td> </tr> <tr> <td style="text-align: center;">B</td> <td style="text-align: center;">B</td> <td style="text-align: center;">C</td> </tr> <tr> <td style="text-align: center;">C</td> <td style="text-align: center;">B</td> <td style="text-align: center;">C</td> </tr> <tr> <td style="text-align: center;">D</td> <td style="text-align: center;">B</td> <td style="text-align: center;">E</td> </tr> <tr> <td style="text-align: center;">⊕</td> <td style="text-align: center;">B</td> <td style="text-align: center;">C</td> </tr> </table>		0	1	→A	B	C	B	B	C	C	B	C	D	B	E	⊕	B	C	10	CO2	K3
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→A	B	C																					
B	B	C																					
C	B	C																					
D	B	E																					
⊕	B	C																					
b.	Show that complement of a regular language is regular	6	CO1	K2																			
<b>Unit-III (16 marks)</b>																							
6	a.	Construct PDA for the language $L = \{ a^n b^n \mid n \geq 1 \}$	8	CO3	K3																		



	b.	Write the procedure to convert CFG to PDA and also convert the following CFG to PDA. PDA. $S \rightarrow aABB \mid aAA$ $A \rightarrow aBB \mid a$ $B \rightarrow bBB \mid A$ $C \rightarrow a$	8	CO3	K3
<b>OR</b>					
7	a.	Construct PDA for the language $L = \{W\$W^r \mid \text{where } W \in (a+b)^*, W^r \text{ is reverse of } W\}$ .	8	CO3	K3
	b.	Construct CFG for the PDA given below $A = (\{q_0, q_1\}, \{0, 1\}, \{S, A\}, d, q_0, S, f)$ where $d$ is given as below $d(q_0, 1, S) = \{(q_0, AS)\}$ $d(q_0, e, S) = \{(q_0, e)\}$ $d(q_0, 1, A) = \{(q_0, AA)\}$ $d(q_0, 0, A) = \{(q_1, A)\}$ $d(q_0, 1, A) = \{(q_1, e)\}$ $d(q_1, 0, S) = \{(q_0, S)\}$	8	CO3	K3
<b>Unit-IV (16 marks)</b>					
8	a.	Explain Post's Correspondence Problem with the help of an example	8	CO4	K3
	b.	Write short note on NP- Hard and NP-Complete Problem	8	CO4	K3
<b>OR</b>					
9	a.	Explain Chomsky's hierarchy of languages.	8	CO4	K3
	b.	Write short note on P and NP Problem with the help of an example.	8	CO4	K3
<b>UNIT-V (16 marks)</b>					
10	a.	Construct a Turing Machine that accepts the language $L = \{1^n 2^n 3^n \mid n \geq 1\}$ .	8	CO5	K3
	b.	Convert the following grammar to GNF $A_1 \rightarrow A_2 A_3$ $A_2 \rightarrow A_3 A_1 \mid b$ $A_3 \rightarrow A_1 A_2 \mid a$	8	CO5	K3
<b>OR</b>					
11	a.	Design TM which will recognize strings containing equal number of a's and b's.	8	CO5	K3
	b.	Use the following grammar : $S \rightarrow ABC \mid BbB,$ $A \rightarrow aA \mid BaC \mid aaa$ $B \rightarrow bBb \mid a \mid D$ $C \rightarrow CA \mid AC$ $D \rightarrow e$ Convert it into CNF.	8	CO5	K3



10:00 10/10/22

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		Course Code: 01UG020			
		O P JINDAL UNIVERSITY			
		B. Tech. V Semester Regular Examinations			
		Data Warehousing and BI SOE-B-CSE501 (4)			
		(Offered to CSE 5 <sup>th</sup> Semester)			
Time: 3 Hrs.		Max. Marks: 100			
		Answer any one question from each unit			
		All questions carry equal marks			
		M	CO	KL	
<b>Section-A</b>					
1	a.	Define the term "Data warehouse".	2	1	1
	b.	How is OLTP different from OLAP?	2	1	1
	c.	What is Frequent set? How it is related with support and confidence?	2	2	1
	d.	Define the term "Association Rule".	2	2	1
	e.	What is classification ?	2	3	1
	f.	What is gain ratio?	2	3	1
	g.	What is clustering?	2	4	1
	h.	What is the importance of similarity metric in clustering ?	2	4	1
	i.	Define the term BI, what are the various advantages of it?	2	2	1
	j.	Define a border set.	2	4	1
<b>Section-B:</b>					
<b>Unit-I</b>					
2	a.	How is a data warehouse different from database? How are they similar?	6	1	2
	b.	What are the Major task associated with Data processing? Explain in detail.	10	1	2
<b>OR</b>					
3	a.	What are the various steps involved in KDD?	6	2	2
	b.	What are the various operation performed on data cube ?Explain with suitable example.	10	2	2
<b>Unit-II</b>					
4	a.	Discuss the importance of discovering association rule.	6	2	2
	b.	Explain Prince-search algorithm to find maximal frequent set.	10	2	3
<b>OR</b>					
5	a.	Define a FP tree. Discuss the method of computing a FP tree.	6	2	3



b.	Apply the Apriori Algorithm on following data set to find the all frequent item set if minimum support is 40% .	10	2	3																																																												
	<table border="1"> <thead> <tr> <th>I<sub>1</sub></th> <th>I<sub>2</sub></th> <th>I<sub>3</sub></th> <th>I<sub>4</sub></th> <th>I<sub>5</sub></th> </tr> </thead> <tbody> <tr><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>0</td><td></td><td>0</td><td>1</td><td>1</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr> </tbody> </table>				I <sub>1</sub>	I <sub>2</sub>	I <sub>3</sub>	I <sub>4</sub>	I <sub>5</sub>	1	1	0	1	1	0	0	0	0	0	0	0	1	1	1	0	1	0	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	0		0	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1
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### Unit-III

6	a.	Describe the essential features in a decision tree. How is it useful to classify data?	6	3	2
	b.	Describe the ID3 algorithm of the decision tree construction .Use the suitable data	10	3	3

### OR

7	a.		6	3	2																				
	b.	<p>Use the dataset below to construct a decision tree which predicts if people pass DWBI (Yes or No), based on the previous GPA (High, Medium, or Low) and whether or not they studied.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>GPA</th> <th>Studied</th> <th>Passed</th> </tr> </thead> <tbody> <tr><td>L</td><td>F</td><td>F</td></tr> <tr><td>L</td><td>T</td><td>T</td></tr> <tr><td>M</td><td>F</td><td>F</td></tr> <tr><td>M</td><td>T</td><td>T</td></tr> <tr><td>H</td><td>F</td><td>T</td></tr> <tr><td>H</td><td>T</td><td>T</td></tr> </tbody> </table> <p>Answer the following</p> <ol style="list-style-type: none"> <li>1. What is the entropy H(Passed)? <span style="float: right;">2 Marks.</span></li> <li>2. What is the entropy H(Passed  GPA)? <span style="float: right;">2Marks.</span></li> <li>3. Draw the full decision tree for this dataset. <span style="float: right;">6 Marks</span></li> </ol>	GPA	Studied	Passed	L	F	F	L	T	T	M	F	F	M	T	T	H	F	T	H	T	T	10	3
GPA	Studied	Passed																							
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### Unit-IV

8	a.	Discuss the importance of similarity metric in clustering. Why is it difficult to	6	4	2
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		handle categorical data for clustering?			
	b.	Describe the working of DBSCAN algorithm. Explain the concept of a cluster as used in DBSCAN.	10	4	3
<b>OR</b>					
9	a.	How is CLARANS different from CLARA?	6	4	2
	b.	Describe the working of PAM algorithm. Compare its performance with CLARA and CLARANS.	10	4	3
<b>UNIT-V</b>					
10	a.	How business intelligence works ?	6	5	2
	b.	What are the various BI methods? Explain in details.	10	5	2
<b>OR</b>					
11	a.	How BI, data analytics, and business analytics work together?	6	5	2
	b.	How to develop a business intelligence strategy?	10	5	2







Course Code: 01UG020

**O P JINDAL UNIVERSITY****B. Tech. V Semester Regular Examinations****Data Warehousing and BI SOE-B-CSE501 (4)**(Offered to CSE 5<sup>th</sup> Semester)**Time: 3 Hrs.****Max. Marks: 100**

Answer any one question from each unit

All questions carry equal marks

**M CO KL****Section-A**

1	a.	Define the term "Data warehouse".	2	1	1
	b.	How is OLTP different from OLAP?	2	1	1
	c.	What is Frequent set? How it is related with support and confidence?	2	2	1
	d.	Define the term "Association Rule".	2	2	1
	e.	What is classification ?	2	3	1
	f.	What is gain ratio?	2	3	1
	g.	What is clustering?	2	4	1
	h.	What is the importance of similarity metric in clustering ?	2	4	1
	i.	Define the term BI, what are the various advantages of it?	2	2	1
	j.	Define a border set.	2	4	1

**Section-B:****Unit-I**

2	a.	How is a data warehouse different from database? How are they similar?	6	1	2
	b.	What are the Major task associated with Data processing? Explain in detail.	10	1	2

**OR**

3	a.	What are the various steps involved in KDD?	6	2	2
	b.	What are the various operation performed on data cube ?Explain with suitable example.	10	2	2

**Unit-II**

4	a.	Discuss the importance of discovering association rule.	6	2	2
	b.	Explain Prince-search algorithm to find maximal frequent set.	10	2	3

**OR**

5	a.	Define a FP tree. Discuss the method of computing a FP tree.	6	2	3
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### Unit-III

6	a.	Describe the essential features in a decision tree. How is it useful to classify data?	6	3	2
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7	a.		6	3	2																				
	b.	<p>Use the dataset below to construct a decision tree which predicts if people pass DWBI (Yes or No), based on the previous GPA (High, Medium, or Low) and whether or not they studied.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>GPA</th> <th>Studied</th> <th>Passed</th> </tr> </thead> <tbody> <tr><td>L</td><td>F</td><td>F</td></tr> <tr><td>L</td><td>T</td><td>T</td></tr> <tr><td>M</td><td>F</td><td>F</td></tr> <tr><td>M</td><td>T</td><td>T</td></tr> <tr><td>H</td><td>F</td><td>T</td></tr> <tr><td>H</td><td>T</td><td>T</td></tr> </tbody> </table> <p>Answer the following</p> <ol style="list-style-type: none"> <li>1. What is the entropy H(Passed)? <span style="float: right;">2 Marks.</span></li> <li>2. What is the entropy H(Passed  GPA)? <span style="float: right;">2Marks.</span></li> <li>3. Draw the full decision tree for this dataset. <span style="float: right;">6 Marks</span></li> </ol>	GPA	Studied	Passed	L	F	F	L	T	T	M	F	F	M	T	T	H	F	T	H	T	T	10	3
GPA	Studied	Passed																							
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### Unit-IV

8	a.	Discuss the importance of similarity metric in clustering. Why is it difficult to	6	4	2
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		handle categorical data for clustering?			
	b.	Describe the working of DBSCAN algorithm. Explain the concept of a cluster as used in DBSCAN.	10	4	3
<b>OR</b>					
9	a.	How is CLARANS different from CLARA?	6	4	2
	b.	Describe the working of PAM algorithm. Compare its performance with CLARA and CLARANS.	10	4	3
<b>UNIT-V</b>					
10	a.	How business intelligence works ?	6	5	2
	b.	What are the various BI methods? Explain in details.	10	5	2
<b>OR</b>					
11	a.	How BI, data analytics, and business analytics work together?	6	5	2
	b.	How to develop a business intelligence strategy?	10	5	2







10:00 AM 05/01/23  
54

Course Code: SOE-B-CSE502

**O P JINDAL UNIVERSITY**

**01UG020 B. Tech. V Semester Regular Examinations**

**SOFTWARE ENGINEERING**



(Offered to CSE)

**Time: 3 Hrs.**

**Max. Marks: 100**

Answer any one question from each unit (500-1000 Words)

All questions carry equal marks

<b>M</b>	<b>CO</b>	<b>KL</b>
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**Unit-I (20 marks)**

1	a.	Explain software myth based on management, customers, and developer's perspective?	10	CO1	K1
	b.	Write the evolving role of software? What are the different factors contributing to the software crisis? Give an example?	10	CO1	K1

**OR**

2	a.	Explain each phase of classical waterfall life cycle model, advantages, and disadvantages, and when to use?	10	CO1	K1
	b.	Explain spiral model, advantages, and disadvantages, and when to use?	10	CO1	K1

**Unit-II (20 marks)**

3	a.	<p>Compare the Walston-Felix model with the SEL model on a software development expected to involve 8 person-years of effort.</p> <p>a. Calculate the number of lines of source code that can be produced.</p> <p>b. Calculate the duration of the development.</p> <p>c. Calculate the productivity in LOC/PY</p> <p>d. Calculate the average manning</p>	10	CO5	K3
	b.	Explain the Walson & Felix model and compare with the SEL model?	10	CO5	K2

**OR**

4	a.	<p>Consider a project to develop a full screen editor. The major components identified are:</p> <p>I. Screen edit</p> <p>II. Command Language Interpreter</p> <p>III. File Input &amp; Output</p> <p>IV. Cursor Movement</p> <p>V. Screen Movement</p> <p><i>The size of these are estimated to be 4k, 2k, 1k, 2k and 3k delivered source code lines. Use COCOMO to determine: -</i></p> <p>a. Overall cost and schedule estimates (assume values for different cost drivers, with at least three of them being different from 1.0)</p> <p>b. Cost &amp; Schedule estimates for different phases.</p>	10	CO5	K3
	b.	Explain the COCOMO model and its different mode with an example?	10	CO5	K2



**Unit-III (20 marks)**

5	a.	Explain the importance of requirements. How many types of requirements are possible and why ?	10	CO2	K1
	b.	Consider the problem of railway reservation system and design the following: a. Problem statement b. Use case diagram c. Use cases.	10	CO2	K3

**OR**

6	a.	What do you understand with the term "requirements elicitation" ? Discuss any two techniques in detail.	10	CO2	K1
	b.	Consider the problem of library management system and design the following: a. Problem statement b. Use case diagram c. Use cases.	10	CO2	K3

**Unit-IV (20 marks)**

7	a.	What are the different implementation issues and challenges are discussed in the class? Explain in details?	10	CO4	K1
	b.	Explain BVA and ECP with an example?	10	CO4	K2

**OR**

8	a.	What do you understand by Test Plan? What are the different attribute considering under the test plan?	10	CO4	K1
	b.	Explain test scenario and test case? What are the different attribute considering under test scenario and test case?	10	CO4	K2

**UNIT-V (20 marks)**

9	a.	What do you understand by DevOps? DevOps is visualized as an infinite loop, what are those steps involve in this infinite loop?	10	CO3	K1
	b.	Explain 8 Best Practices for Implementing DevOps?	10	CO3	K2

**OR**

10	a.	What are the different challenges in Enterprise DevOps Implementation?	10	CO3	K1
	b.	Explain 7 Steps to Successful DevOps Adoption?	10	CO3	K2



Please provide the following Table and chart to the students on demand basis.

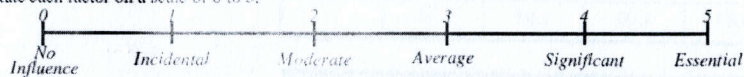
Counting function points

Functional Units	Weighting factors		
	Low	Average	High
External Inputs (EI)	3	4	6
External Output (EO)	4	5	7
External Inquiries (EQ)	3	4	6
External logical files (ILF)	7	10	15
External Interface files (EIF)	5	7	10

Table 1 : Functional units with weighting factors

Table 3 : Computing function points.

Rate each factor on a scale of 0 to 5.



Number of factors considered (  $F_i$  )

1. Does the system require reliable backup and recovery ?
2. Is data communication required ?
3. Are there distributed processing functions ?
4. Is performance critical ?
5. Will the system run in an existing heavily utilized operational environment ?
6. Does the system require on line data entry ?
7. Does the on line data entry require the input transaction to be built over multiple screens or operations ?
8. Are the master files updated on line ?
9. Is the inputs, outputs, files, or inquiries complex ?
10. Is the internal processing complex ?
11. Is the code designed to be reusable ?
12. Are conversion and installation included in the design ?
13. Is the system designed for multiple installations in different organizations ?
14. Is the application designed to facilitate change and ease of use by the user ?

Software Project	$a_b$	$b_b$	$c_b$	$d_b$
Organic	2.4	1.05	2.5	0.38
Semidetached	3.0	1.12	2.5	0.35
Embedded	3.6	1.20	2.5	0.32

Table 4(a): Basic COCOMO coefficients



Please provide the following Table and chart to the students on demand basis.

Multipliers of different cost drivers

Cost Drivers	RATINGS					
	Very low	Low	Nominal	High	Very high	Extra high
<b>Product Attributes</b>						
RELY	0.75	0.88	1.00	1.15	1.40	--
DATA	--	0.94	1.00	1.08	1.16	--
CPLX	0.70	0.85	1.00	1.15	1.30	1.65
<b>Computer Attributes</b>						
TIME	--	--	1.00	1.11	1.30	1.66
STOR	--	--	1.00	1.06	1.21	1.56
VIRT	--	0.87	1.00	1.15	1.30	--
TURN	--	0.87	1.00	1.07	1.15	--

Cost Drivers	RATINGS					
	Very low	Low	Nominal	High	Very high	Extra high
<b>Personnel Attributes</b>						
ACAP	1.46	1.19	1.00	0.86	0.71	--
AEXP	1.29	1.13	1.00	0.91	0.82	--
PCAP	1.42	1.17	1.00	0.86	0.70	--
VEXP	1.21	1.10	1.00	0.90	--	--
LEXP	1.14	1.07	1.00	0.95	--	--
<b>Project Attributes</b>						
MODP	1.24	1.10	1.00	0.91	0.82	--
TOOL	1.24	1.10	1.00	0.91	0.83	--
SCED	1.23	1.08	1.00	1.04	1.10	--


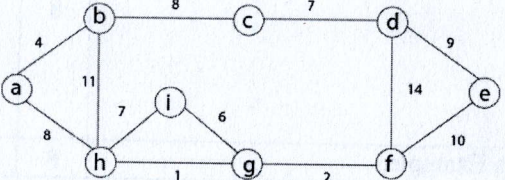
Table 5: Multiplier values for effort calculations

Project	$a_i$	$b_i$	$c_i$	$d_i$
Organic	3.2	1.05	2.5	0.38
Semidetached	3.0	1.12	2.5	0.35
Embedded	2.8	1.20	2.5	0.32

Table 6: Coefficients for intermediate COCOMO

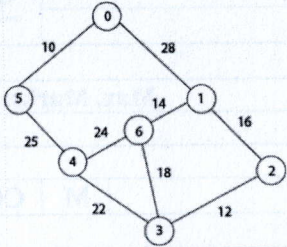


09/01/23

		Program Code: 01UG020			
O P JINDAL UNIVERSITY					
B. Tech. V Semester Regular Examinations					
Analysis & Design Of Algorithm					
(Subject Code : SOE-B-CSE503)					
Time: 3 Hrs.		Max. Marks: 100			
Answer any one question from each unit					
All questions carry equal marks					
		M	CO	KL	
<b>Section-A</b>					
1	a.	Define Asymptotic Notation.	2	1	1
	b.	Explain Time & Space Complexity with Example.	2	1	1
	c.	What is Minimum Cost Spanning Tree?	2	2	1
	d.	Describe Bi-Connected Graph.	2	2	1
	e.	What is Greedy Approach?	2	3	1
	f.	Explain Divide & Conquer.	2	3	1
	g.	What are the drawbacks of Dynamic Programming?	2	4	1
	h.	What is All Pair shortest Path Problem?	2	4	1
	i.	What is Backtracking?	2	5	1
	j.	What is Branch & Bound method?	2	5	1
<b>Section-B:</b>					
<b>Unit-I</b>					
2	a.	Solve the following recurrence relation by Back Substitution Method : $T(n) = T(n-1) + n$ with $T(0) = 0$	8	1	3
	b.	Solve the following recurrence relation by Master Theorem: I. $T(n) = 2T(n/2) + n^2$ II. $T(n) = 4T(n/2) + n^3$	8	1	3
<b>OR</b>					
3	a.	Solve the following recurrence relation by Master Theorem: I. $T(n) = 16T(n/8) + n^2$ II. $T(n) = 3T(2n/6) + n$	8	1	3
	b.	Solve the following recurrence relation by Recursion Tree Method: $T(n) = 3T(n/4) + cn^2$	8	1	3
<b>Unit-II</b>					
4	a.	Find An Articulation Point of Any Connected Graph.		2	2
	b.	Construct the minimum spanning tree (MST) for the given graph using Kruskal's Algorithm. 	8	2	3



**OR**

5	a.	Construct the minimum spanning tree (MST) for the given graph using Prim's Algorithm. 	8	2	3
	b.	Define Simple Union & Simple Find in Disjoint Sets With Algorithm.	8	2	2

**Unit-III**

6	a.	Perform linear Search with Time Complexity analysis of Best Case & Worst Case with Relative program.	8	3	3
	b.	Perform Merge Sort with Time Complexity analysis of Best Case & Worst Case with Relative program.	8	3	3

**OR**

7	a.	Write an algorithm for Iterative binary Search.	8	3	2
	b.	Perform Quick Sort with Time Complexity analysis of Best Case & Worst Case with Relative program.	8	3	3

**Unit-IV**

8	a.	Define the Floyd's Algorithm.	8	4	2
	b.	Explain Travelling Salesman Problem Using Dynamic Programming	8	4	2

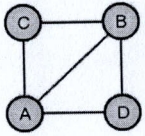
**OR**

9	a.	Find the optimal solution for the 0/1 knapsack problem making use of dynamic programming approach. Consider- $n = 4$ $w = 5$ kg $(w_1, w_2, w_3, w_4) = (2, 3, 4, 5)$ $(b_1, b_2, b_3, b_4) = (3, 4, 5, 6)$	8	4	3
	b.	Applications of Dynamic Programming?	8	4	2

**UNIT-V**


10	a.	What is Hamiltonian Circuit?	8	5	2
	b.	Solve the sum of subset problems using backtracking algorithmic strategy for the following data: $n = 4$ $W = (w_1, w_2, w_3, w_4) = (11, 13, 24, 7)$ and $M = 31$	8	5	3

**OR**

11	a.	Show that given graph has a Hamiltonian cycle 	8	5	3
	b.	NP - Hard & NP - Complete Problem Explain with Example.	8	5	2



11/01/23  
 69

<b>Course Code: SOE-B-CSE504</b>						
<b>O P JINDAL UNIVERSITY</b>				 <b>OPJU</b> <small>UNIVERSITY OF STEEL TECHNOLOGY AND MANAGEMENT</small>		
<b>B. Tech. V Semester Regular Examinations</b>						
<b>Machine Learning</b>						
Computer Science and Engineering						
<b>Time: 3 Hrs.</b>		<b>Max. Marks: 100</b>				
Answer any one question from each unit						
All questions carry equal marks						
				<b>M</b>	<b>CO</b>	<b>KL</b>
<b>Section-A</b>						
1	a.	How outliers affect the performance of M/L model.	2	1	1	
	b.	Explain random sampling.	2	2	1	
	c.	Explain conditional probability with the help of suitable example	2	3	1	
	d.	Why Bayes classifier is called Naive Bayes classifier?	2	5	1	
	e.	Define information gain.	2	4	1	
	f.	What is ensemble learning?	2	4	1	
	g.	Why random forest gives higher performance in classification as compared to decision tree?	2	3	1	
	h.	What do you mean by support vectors in SVM?	2	2	1	
	i.	Explain bootstrap and aggregation process in random forest.	2	1	1	
	j.	Explain multi-collinearity?	2	5	5	
<b>Section-B:</b>						
<b>Unit-I</b>						
2	a.	Explain the importance of significance level and hypothesis testing?	8	1	3	
	b.	Explain under-fitting and over-fitting with suitable example?	8	1	3	
OR						
3	a.	Explain bias and variance with the help of suitable example?	8	1	3	
	b.	Describe ID3 algorithm for decision tree? What are importance of entropy while creating decision tree?	8	1	3	
Unit-II						
4	a.	Find the linear regression equation for the following sets of data	8	2	3	



	x	2	4	6	8			
	y	3	7	5	10			
b.	Explain logistic regression with suitable example.					8	2	3

OR

5	a.	<p>The dataset for pass/fail of 5 students are given in the table. If the logistic regression is used as classifier and given <math>\log(\text{Odds}) = -64 + 2 * \text{Hours}</math></p> <p>1. Calculate the probability of pass for the student who studied 33 hours.</p> <p>2. At least how many hours a students have to study to get 95% probability.</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Hours Study</th> <th>Results (Pass=1; Fail=0)</th> </tr> </thead> <tbody> <tr> <td>29</td> <td>0</td> </tr> <tr> <td>15</td> <td>0</td> </tr> <tr> <td>33</td> <td>1</td> </tr> <tr> <td>28</td> <td>1</td> </tr> <tr> <td>39</td> <td>1</td> </tr> </tbody> </table>			Hours Study	Results (Pass=1; Fail=0)	29	0	15	0	33	1	28	1	39	1	8	2	3
	Hours Study	Results (Pass=1; Fail=0)																	
29	0																		
15	0																		
33	1																		
28	1																		
39	1																		
b.	Explain multiple linear regression and correlation with the help of suitable example?			8	2	3													

**Unit-III**

6	a.	<p>Suppose we are given the following positively labeled data points in <math>R^2</math>: (4,1),(4,-1),(7,1),(7,-1) and the following negatively labeled data points in <math>R^2</math> (2, 0),(0, 2),(0,-2),(-2,-0). Plot the points in <math>R^2</math> and find and plot hyperplane which will classify the given points.</p>			8	3	3
	b.	Explain SVM classifier? Explain the role of kernels in separating non-linear data?			8	3	3

OR

7	a.	Suppose we are given the following positively labeled data points in $R^2$ : (4,1),(4,-1),(7,1),(7,-1) and the following			8	3	3
---	----	--	--	--	---	---	---



		negatively labeled data points in $R^2$ (3, 0),(0, 3),(0,-3),(-3,-0). Plot the points in $R^2$ and find the weight matrix and Bias and plot hyperplane which will classify the given points.			
	b.	Is SVM maximum margin classifier? Comment and justify correctness and incorrectness of your statement.	8	3	3

**Unit-IV**

8	a.	<p>Discuss pros and cons of KNN Method. Data from questionnaires survey has been collected to classify whether a tissue paper is good or bad based on acid durability and strength. The training samples are given as</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Acid Durability</th> <th>Strength</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>7</td> <td>7</td> <td>Bad</td> </tr> <tr> <td>7</td> <td>4</td> <td>Bad</td> </tr> <tr> <td>3</td> <td>4</td> <td>Good</td> </tr> <tr> <td>1</td> <td>4</td> <td>Good</td> </tr> <tr> <td>2</td> <td>3</td> <td>Good</td> </tr> </tbody> </table> <p>Now the factory produces a new tissue paper with durability=3 and strength=7. Classify the new tissue paper. (Assume K=3)</p>	Acid Durability	Strength	Classification	7	7	Bad	7	4	Bad	3	4	Good	1	4	Good	2	3	Good	8	4	3
	Acid Durability	Strength	Classification																				
7	7	Bad																					
7	4	Bad																					
3	4	Good																					
1	4	Good																					
2	3	Good																					
	b.	What are the measurement used to decide class of unknown instance in the K-Mean algorithm? Explain with suitable example.	8	4	3																		

**OR**

9	a.	<p>Explain K-Means clustering with pros and cons. Suppose there is different medicines with tow features as given in the table. Group the medicines in two groups.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Medicine</th> <th>Strength</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Medicine A</td> <td>1</td> <td>1</td> </tr> <tr> <td>Medicine B</td> <td>2</td> <td>1</td> </tr> <tr> <td>Medicine C</td> <td>4</td> <td>3</td> </tr> <tr> <td>Medicine D</td> <td>5</td> <td>4</td> </tr> </tbody> </table>	Medicine	Strength	Classification	Medicine A	1	1	Medicine B	2	1	Medicine C	4	3	Medicine D	5	4	8	4	3
	Medicine	Strength	Classification																	
Medicine A	1	1																		
Medicine B	2	1																		
Medicine C	4	3																		
Medicine D	5	4																		
	b.	How to choose optimal value of K in key means algorithm? Explain with the help of suitable example.	8	4	3															



### UNIT-V

10	a.	<p>The sample dataset contains 1000 data points. The model correctly classifies 560 samples as positive and 330 as negative class respectively. The model incorrectly classifies 60 records as positive but actual class is negative and 50 records as negative but actual class is positive. Based on the given information, draw the confusion matrix and calculate following. Calculate</p> <ol style="list-style-type: none"> <li>1. Accuracy</li> <li>2. True Positive Rate</li> <li>3. True Negative Rate</li> <li>4. False Positive Rate</li> <li>5. Precision and Recall</li> </ol>	8	5	3
	b.	<p>What are the different applications of Naive Bayes Classifier? Derive and explain Naive Bayes Classifier.</p>	8	5	3

OR

11	a.	<p>Given the tabular data.</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 30%;"><b>Outlook</b></td> <td style="width: 40%;"><b>Play</b></td> <td style="width: 30%;"></td> </tr> <tr> <td> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td></td><td>Yes</td><td>No</td></tr> <tr><td>Hot</td><td>2</td><td>2</td></tr> <tr><td>Mild</td><td>4</td><td>2</td></tr> <tr><td>Cool</td><td>3</td><td>1</td></tr> <tr><td>Total</td><td>9</td><td>5</td></tr> </table> </td> <td> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td></td><td></td></tr> <tr><td>Yes</td><td>9</td></tr> <tr><td>No</td><td>5</td></tr> <tr><td>Total</td><td>15</td></tr> </table> </td> <td></td> </tr> <tr> <td style="text-align: center;"><b>Temperature</b></td> <td></td> <td> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td></td><td>Yes</td><td>No</td></tr> <tr><td>Sunny</td><td>2</td><td>3</td></tr> <tr><td>Overcast</td><td>4</td><td>0</td></tr> <tr><td>Rainy</td><td>3</td><td>2</td></tr> <tr><td>Total</td><td>9</td><td>5</td></tr> </table> </td> </tr> </table> <p>If Today (Sunny, Hot) then find the probability whether playing will be suitable or not. (Use Bayes theorem)</p>	<b>Outlook</b>	<b>Play</b>		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td></td><td>Yes</td><td>No</td></tr> <tr><td>Hot</td><td>2</td><td>2</td></tr> <tr><td>Mild</td><td>4</td><td>2</td></tr> <tr><td>Cool</td><td>3</td><td>1</td></tr> <tr><td>Total</td><td>9</td><td>5</td></tr> </table>		Yes	No	Hot	2	2	Mild	4	2	Cool	3	1	Total	9	5	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td></td><td></td></tr> <tr><td>Yes</td><td>9</td></tr> <tr><td>No</td><td>5</td></tr> <tr><td>Total</td><td>15</td></tr> </table>			Yes	9	No	5	Total	15		<b>Temperature</b>		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td></td><td>Yes</td><td>No</td></tr> <tr><td>Sunny</td><td>2</td><td>3</td></tr> <tr><td>Overcast</td><td>4</td><td>0</td></tr> <tr><td>Rainy</td><td>3</td><td>2</td></tr> <tr><td>Total</td><td>9</td><td>5</td></tr> </table>		Yes	No	Sunny	2	3	Overcast	4	0	Rainy	3	2	Total	9	5	8	5	3
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Total	9	5																																																		
	b.	<p>What are the importance of evaluation of machine learning models? Explain ROC and AROC curve with suitable example.</p>	8	5	3																																															



Course Code: SOE-B-CSE505

**O P JINDAL UNIVERSITY****B. Tech. V Semester Regular Examinations****ENGINEERING ECONOMICS****R 20**

(Offered to CSE)

**Time: 3 Hrs.****Max. Marks: 100**

Answer any one question from each unit

All questions carry equal marks

**M CO KL****Unit-I ( 20 marks)**

1	a.	What is the significance of Engineering economics? Elaborate with the help of an example. Also, discuss its role in modern-day start-ups.	10	1	2
	b.	Elaborate the concept of the physical environment and economic environment. How both the environment can be measured. Explain with the help of an example. Also define the economic and physical efficiency.	10	1	2

**OR**

2	a.	What is cash flow? Explain all the types of cash flow with the help of a diagram and example.	10	1	2
	b.	The "XAR Pvt. Ltd" has taken a loan of 8 lakh rupees from the "ABC bank" as an investment for their Start-Up. The bank has offered a 14 percent per annum rate of interest. The firm has agreed to pay back the loan in 5 years in equated monthly installments. Find the EMI as per the given information that needs to pay every month by the firm to the bank.	10	2	3

**Unit-II (20 marks)**

3	a.	What do you understand about the principle of equivalence? Also, explain capitalized equivalent amount with an example.	10	1	2																			
	b.	Calculate the IRR of the investment of Rs. 31,75,000, which yields the following cash inflow. Firm is expecting at least 25% of return. Whether the firm should invest in this project or not?	10	2	3																			
		<table border="1"> <thead> <tr> <th>Year</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> <th>11</th> </tr> </thead> <tbody> <tr> <td>Cash Inflow</td> <td>6 lakh</td> <td>7 lakh</td> <td>8 lakh</td> <td>9 lakh</td> <td>10 lakh</td> <td>11 lakh</td> <td>12 lakh</td> <td>13 lakh</td> <td>14 lakh</td> <td>15 lakh</td> <td>16 lakh</td> </tr> </tbody> </table>				Year	1	2	3	4	5	6	7	8	9	10	11	Cash Inflow	6 lakh	7 lakh	8 lakh	9 lakh	10 lakh	11 lakh
Year	1	2	3	4	5	6	7	8	9	10	11													
Cash Inflow	6 lakh	7 lakh	8 lakh	9 lakh	10 lakh	11 lakh	12 lakh	13 lakh	14 lakh	15 lakh	16 lakh													

**OR**

4	a.	i) Mr. "J" have saved and deposited money with "X" finance company since Jan 2016, that promise to give a return of 18% per annum. Find out the value of savings in Jan 2023.	10	2	3																
		<table border="1"> <thead> <tr> <th>Year</th> <th>JAN 2016</th> <th>JAN 2017</th> <th>JAN 2018</th> <th>JAN 2019</th> <th>JAN 2020</th> <th>JAN 2021</th> <th>JAN 2022</th> </tr> </thead> <tbody> <tr> <td>Savings</td> <td>1,20,000</td> <td>1,30,000</td> <td>1,25,000</td> <td>1,30,000</td> <td>1,15,000</td> <td>1,20,000</td> <td>1,15,000</td> </tr> </tbody> </table>				Year	JAN 2016	JAN 2017	JAN 2018	JAN 2019	JAN 2020	JAN 2021	JAN 2022	Savings	1,20,000	1,30,000	1,25,000	1,30,000	1,15,000	1,20,000	1,15,000
		Year				JAN 2016	JAN 2017	JAN 2018	JAN 2019	JAN 2020	JAN 2021	JAN 2022									
	Savings	1,20,000	1,30,000	1,25,000	1,30,000	1,15,000	1,20,000	1,15,000													
ii) For Project "K", calculate the present worth of the expected given return at the discount rate of 15%.																					
<table border="1"> <thead> <tr> <th>Year</th> <th>JAN 2024</th> <th>JAN 2025</th> <th>JAN 2026</th> <th>JAN 2027</th> <th>JAN 2028</th> <th>JAN 2029</th> <th>JAN 2030</th> </tr> </thead> <tbody> <tr> <td>Ex. Return</td> <td>1,20,000</td> <td>1,30,000</td> <td>1,10,000</td> <td>1,65,000</td> <td>1,90,000</td> <td>95,000</td> <td>98,000</td> </tr> </tbody> </table>	Year	JAN 2024	JAN 2025	JAN 2026	JAN 2027	JAN 2028	JAN 2029	JAN 2030	Ex. Return	1,20,000	1,30,000	1,10,000	1,65,000	1,90,000	95,000	98,000					
Year	JAN 2024	JAN 2025	JAN 2026	JAN 2027	JAN 2028	JAN 2029	JAN 2030														
Ex. Return	1,20,000	1,30,000	1,10,000	1,65,000	1,90,000	95,000	98,000														
b.	Explain the present worth and future worth method to calculate the time value of money with the help of an example.	10	2	2																	

**Unit-III (20 marks)**

5	a.	Discuss the conceptual difference between Depreciation and Depletion. Also, highlight the causes of depreciation.	10	1	2
	b.	A machine was purchased on April 1, 2011, for Rs. 6,50,000. The cost of transportation was Rs. 25,000 and the cost of Installation was Rs. 15,000. If the life of the machine is 15 years and the rate of depreciation is given 12% per annum. Calculate the value of the machine on 31st march 2022 after depreciation. Follow the written down value method to calculate depreciation.	10	2	3



OR					
6	a.	What is the need and objective of depreciation for the firm? Also, discuss the factors affecting the amount of depreciation.	10	1	2
	b.	The price of the machine purchased for the project is Rs. 1,76,872. Net residual value is estimated to be Rs. 2302. If, the amount of depreciation to be charged every year is Rs. 15870. What is the rate of depreciation? Calculate the life of the machine. Show the change in the value of the machine every year in the tabular format.	10	2	3

**Unit-IV (20 marks)**

7	a.	Explain the following concepts of Cost with the help of an example. i) Opportunity Cost. ii) Economic Cost. iii) Social Cost.	10	3	2																																																																																																											
	b.	<p>Complete the cost schedule:</p> <table border="1"> <thead> <tr> <th>L</th> <th>Q</th> <th>TVC</th> <th>TFC</th> <th>TC</th> <th>AVC</th> <th>AFC</th> <th>AC</th> <th>MC</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td></td> <td>10000</td> <td>10000</td> <td>----</td> <td>----</td> <td>----</td> <td>----</td> </tr> <tr> <td>1</td> <td></td> <td>800</td> <td></td> <td>10800</td> <td></td> <td></td> <td>36</td> <td>2.66</td> </tr> <tr> <td>2</td> <td>700</td> <td>1600</td> <td></td> <td>11600</td> <td>2.285</td> <td>14.28</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td>1200</td> <td></td> <td></td> <td></td> <td>2</td> <td></td> <td>10.33</td> <td>1.6</td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> <td></td> <td>1.777</td> <td></td> <td>7.333</td> <td></td> </tr> <tr> <td>5</td> <td>2300</td> <td></td> <td></td> <td></td> <td></td> <td>4.347</td> <td></td> <td></td> </tr> <tr> <td>6</td> <td></td> <td></td> <td></td> <td></td> <td>1.777</td> <td>3.703</td> <td>5.481</td> <td>2</td> </tr> <tr> <td>7</td> <td>3000</td> <td></td> <td></td> <td></td> <td>1.866</td> <td></td> <td>5.2</td> <td></td> </tr> <tr> <td>8</td> <td></td> <td></td> <td></td> <td></td> <td>2</td> <td>3.125</td> <td>5.125</td> <td>4</td> </tr> <tr> <td>9</td> <td>3300</td> <td></td> <td></td> <td></td> <td>2.181</td> <td></td> <td></td> <td></td> </tr> <tr> <td>10</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>2.985</td> <td>5.373</td> <td></td> </tr> </tbody> </table>	L	Q	TVC	TFC	TC	AVC	AFC	AC	MC	0	0		10000	10000	----	----	----	----	1		800		10800			36	2.66	2	700	1600		11600	2.285	14.28			3	1200				2		10.33	1.6	4					1.777		7.333		5	2300					4.347			6					1.777	3.703	5.481	2	7	3000				1.866		5.2		8					2	3.125	5.125	4	9	3300				2.181				10						2.985	5.373		10	3
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**OR**

8	a.	What are the theories of Cost? Explain with the help of a schedule and graph.	10	3	2
	b.	<p>I. A firm "NEXT GEN" having following inventory conditions. Total usage of raw material is 6000 unit in an year. Ordering cost per lot is Rs. 600, and storage cost per unit is Rs 10. Firm use raw material in a range of 15 to 30 unit per day. Raw material provider delivers inputs in a range of 2 to 4 days. Calculate Economic order quantity. And Reorder level.</p> <p>II. If firm purchase machine for Rs. 1,50,000, Calculate Break even quantity for firm. Given that the cost of labour (AVC) per unit is Rs 15 and selling price per unit is Rs 40.</p>	10	3	3

**Unit-V (20 marks)**

9	a.	What do you understand by fiscal policy? Discuss the objectives of policy and role of government to use policy to balance the economic growth of the country.	10	3	2
	b.	What do you understand by Monetary policy? Discuss the tools and techniques used by RBI to control money supply in the economy.	10	3	2

**OR**

10	a.	Write short notes on i) Inflation ii) Deflation iii) Stagflation	10	3	2
	b.	Discuss the current foreign policy of India. Especially in terms of intercontinental grouping and trade.	10	3	4



10:00 AM to 01:00 PM

03/01/23

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		Course Code:SOE-B-EE501			
O P JINDAL UNIVERSITY					
III B. Tech. V Semester Regular Examinations					
POWER ELECTRONICS					
(Offered to EE)					
Time: 3 Hrs.		Max. Marks: 100			
Answer any one question from each unit					
All questions carry equal marks					
		M	CO	KL	
Unit-I ( 20 marks)					
1	a.	Construct the V-I characteristics of SCR	10	1	3
	b.	Classify the various triggering methods of SCR	10	1	4
OR					
2	a.	Discuss various protection schemes of SCR	10	1	6
	b.	Examine various firing methods of SCR	10	1	4
Unit-II					
3	a.	Elaborate the single-phase full wave controlled converter with R-L load	10	2	6
	b.	Discuss the single-phase semi-converter operation with R-L Load	10	2	6
OR					
4	a.	Explain the operation of three-phase semi converter with R load.	10	2	5
	b.	A three-phase half-wave converter is supplying a load with a continuous constant current of 50A over a firing angle from 0 to 60 degrees. Estimate the power dissipated by the load at these limiting values of firing angle. The supply voltage is 415V (line).	10	2	6
Unit-III					
5	a.	Analyze the step-down converter with a suitable diagram and waveforms.	10	3	4
	b.	In a type A chopper, the input supply voltage is 230 V the load resistance is 10Ω and there is a voltage drop of 2 V across the chopper thyristor when it is on. For a duty ratio of 0.4, compute the average and rms values of the output voltage. Also find the chopper efficiency	10	3	5
OR					
6	a.	Analyze the step-up choppers with a suitable diagram and waveforms.	10	3	4
	b.	A step up chopper has an input voltage of 150V. The voltage output needed is 450V. Given, that the thyristor has a conducting time of 150μseconds. Estimate the chopping frequency.	10	3	6
Unit-IV					
7	a.	Evaluate the single phase full bridge inverter	10	4	5
	b.	Evaluate the single phase half bridge inverter	10	4	5
OR					
8	a.	Explain the three phase inverter 180 degree mode.	10	4	5
	b.	Compare voltage source inverter with current source inverter.	10	4	4

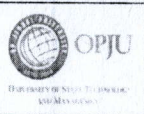


### UNIT-V

9	a.	Discuss single phase full controlled bridge voltage controller	10	4	6
	b.	A single phase voltage controller is employed for controlling the power flow from 230V, 50Hz source into a load circuit consisting of $R=3\ \Omega$ and $\omega L=4\ \Omega$ . Determine (i) the range of firing angle (ii) the maximum value of rms load current (iii) the maximum power and power factor (iv) The maximum values of average and rms thyristor currents.	10	4	5
<b>OR</b>					
10	a.	Analyze the Step down Cyclo converters with a suitable diagram and waveforms	10	4	4
	b.	Analyze the Step up cyclo converters with a suitable diagram and waveforms	10	4	4



<b>Course Code: SOE-B-EE502</b>		
<b>O P JINDAL UNIVERSITY</b>		
<b>B. Tech. V<sup>th</sup> Semester Regular Examinations</b>		
<b>POWER SYSTEMS II</b>		
<b>ELECTRICAL ENGINEERING</b>		
<b>Time: 3 Hrs.</b>	<b>Max. Marks: 100</b>	
Answer any one question from each unit		
All questions carry equal marks		



M	CO	KL
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**Unit-I**

1	<p>a. Draw the per unit impedance diagram for the power system shown in Fig. 1. Neglect resistance, and use generator rating as base. The ratings of the generator, motor, and transformer are</p> <p>Generator            50 MVA, 25 kV, <math>X'' = 15\%</math>          Motor                60 MVA, 11kV, <math>X'' = 20\%</math>          Y-Y Transformer   50 MVA, 33Y-220Y kV, <math>X=16\%</math>          Y - <math>\Delta</math> Transformer 40 MVA, 11 <math>\Delta</math>-220 Y kV, <math>X= 16\%</math>.</p> <div style="text-align: center;"> </div> <p style="text-align: center;">Fig. 1</p>	10	CO1	K3
	<p>b. Explain the per unit system of analyzing the power system problems. Discuss the advantages of this method over the absolute method of analysis.</p>	10	CO1	K3

**OR**

2	<p>a. A delta connected balanced resistive load is connected across an unbalanced three phase supply. With the currents in line A and B specified as <math>10\angle 30^\circ</math> and <math>15\angle 60^\circ</math>, find the symmetrical components of line current.</p>	10	CO1	K3
	<p>b. Explain clearly the concept of reactive power in single phase and three phase circuits.</p>	10	CO1	K2

**Unit-II**

3	<p>a. The system data for a load flow solution are given in the table 1 and table 2. Determine the voltage at the end of first iteration by Gauss-Seidel method. Take <math>\alpha = 1</math>.</p>	10	CO2	K3
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		<table border="1"> <thead> <tr> <th>Bus Code</th> <th>P</th> <th>Q</th> <th>V</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-</td> <td>-</td> <td>1.06∠0</td> <td>Slack</td> </tr> <tr> <td>2</td> <td>0.5</td> <td><math>0.1 \leq Q_2 \leq 1</math></td> <td>1.04</td> <td>PV</td> </tr> <tr> <td>3</td> <td>0.4</td> <td>0.3</td> <td>-</td> <td>PQ</td> </tr> <tr> <td>4</td> <td>0.3</td> <td>0.1</td> <td>-</td> <td>PQ</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Bus Code</th> <th>Admittance</th> </tr> </thead> <tbody> <tr> <td>1-2</td> <td>1-j5</td> </tr> <tr> <td>1-3</td> <td>1.2-j4</td> </tr> <tr> <td>2-3</td> <td>0.5-j4</td> </tr> <tr> <td>2-4</td> <td>1.1-j2</td> </tr> <tr> <td>3-4</td> <td>1.2-j3</td> </tr> </tbody> </table>	Bus Code	P	Q	V	Remark	1	-	-	1.06∠0	Slack	2	0.5	$0.1 \leq Q_2 \leq 1$	1.04	PV	3	0.4	0.3	-	PQ	4	0.3	0.1	-	PQ	Bus Code	Admittance	1-2	1-j5	1-3	1.2-j4	2-3	0.5-j4	2-4	1.1-j2	3-4	1.2-j3			
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2-4	1.1-j2																																									
3-4	1.2-j3																																									
b.	In the above question, let the reactive power constraint on generator Bus 2 is changed to $0.2 \leq Q_2 \leq 1.0$ . Solve the voltages using Gauss-Seidel method.	10	CO2	K3																																						
<b>OR</b>																																										
4	a.	What are the different types of buses used in a power flow solution and explain their significance.	10	CO2	K2																																					
	b.	Derive the expression for power flow equation and explain with flow chart how Gauss-Seidel method is used for solving a load flow problem comprising PQ and PV buses.	10	CO2	K3																																					
<b>Unit-III</b>																																										
5	a.	The fuel inputs per hour of plants 1 and 2 are given as $F_1 = 0.2P_1^2 + 40P_1 + 120 \text{ Rs per hr}$	10	CO3	K3																																					



$$F_1 = 0.25P_2^2 + 30P_2 + 150 \text{ Rs per hr}$$

Determine the economic operating schedule and the corresponding cost of generation if the maximum and minimum loading on each unit is 100MW and 25 MW, the demand is 180 MW, and the transmission losses are neglected. If the load is equally shared by both units, determine the savings obtained by loading the units as per equal incremental production cost.

	b.	Explain what do you mean by unit commitment and how does it differ from economic load dispatch problem.	10	CO3	K2
<b>OR</b>					
6	a.	Discuss briefly various constraints imposed while solving the unit commitment problem.	10	CO3	K2
	b.	Derive the expression for optimum load dispatching including transmission losses.	10	CO3	K2
<b>Unit-IV</b>					
7	a.	Explain the automatic voltage control scheme with neat block diagram.	10	CO4	K2
	b.	Write short notes on two area load frequency control.	10	CO4	K2
<b>OR</b>					
8	a.	Write short notes on automatic load dispatching.	10	CO4	K2
	b.	Write short notes on supervisory control and data acquisition system.	10	CO4	K2
<b>UNIT-V</b>					
9	a.	Derive swing equation and explain its significance.	10	CO5	K2
	b.	Explain the factors affecting steady state stability and transient stability and how they can be improved.	10	CO5	K2
<b>OR</b>					
10	a.	Define steady state stability and derive the expression for synchronizing power.	10	CO5	K2
	b.	Explain working of energy management system.	10	CO5	K2







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10/00/20120 09/09/23  
29

<b>Course Code: SOE-B-EE503</b>					
<b>O P JINDAL UNIVERSITY</b>					
<b>B. Tech. 5<sup>th</sup> Semester Regular Examinations</b>					
<b>ELECTRICAL MACHINE-2</b>					
(Offered to ELECTRICAL ENGINEERING (EE) (01UG060))					
<b>Time: 3 Hrs.</b>			<b>Max. Marks: 100</b>		
Answer any one question from each unit					
All questions carry equal marks					
			<b>M</b>	<b>CO</b>	<b>KL</b>
<b>Unit-I ( 20 marks)</b>					
1	a.	Write Short Notes on <ul style="list-style-type: none"> <li>• Torque-Speed Characteristic of 3 Phase Induction Motor</li> <li>• Power Stages in 3-Phase Induction Motor</li> <li>• Cogging and Crawling in 3-Phase Induction Motor</li> </ul>	20	1	2
	<b>OR</b>				
2	a.	Derive the relationship between the various torques in three phase induction motor.	10	1	3
	b.	An induction motor has an efficiency of 0.9 when the shaft load is 45 kW. At this load, stator ohmic loss and rotor ohmic loss each is equal to the iron loss. The mechanical loss is one-third of the no-load losses. Neglect ohmic losses at no-load. Calculate the slip	10	1	3
<b>Unit-II</b>					
3	a.	A 20 KW, 400 V, 3 ph induction motor has full load efficiency and power factor of 0.86 and 0.88. Short circuit current at 200 V is 70 A. If motor is started by a star-delta starter, find: <ul style="list-style-type: none"> <li>• Ratio of starting to full load currents</li> </ul> Starting torque as a ratio of full load torque full load slip is 4%. On full load M/C is connected in delta.	10	1	3
	b.	Write Short Notes on <ul style="list-style-type: none"> <li>• Speed control of a 3-phase squirrel cage induction motor</li> <li>• Induction generators</li> </ul>	10	2	4
<b>OR</b>					
4	a.	Briefly discuss the various starting methods of 3-phase induction motor	10	2	6
	b.	A three phase, 4 pole, 1440 RPM, 50 Hz induction motor has star connected rotor winding with resistance 0.2 Ω/phase and standstill reactance of 1 Ω/phase. When stator is energized at rated voltage and frequency, the rotor induced emf at standstill is 120 Ω/phase. Calculate <ul style="list-style-type: none"> <li>• Rotor current, rotor power factor, torque at starting and full load and compare them.</li> <li>• If an external resistance 1 Ω/phase is inserted in the rotor circuit, compute rotor power factor, torque at starting.</li> </ul>	10	2	3
<b>Unit-III</b>					
5	a.	Explain No load and blocked rotor test for single phase induction motor to determine equivalent parameters.	10	2	2



	b.	Explain construction, working principle of capacitor split phase single phase induction motor. Also draw the phasor diagram and torque-speed characteristic.	10	5	2
<b>OR</b>					
6	a.	Explain the double field revolving theory for the single phase induction motor and explain why this M/Cs are not self started. Also derive the expression for forward and backward slips.	10	5	2
	b.	Write Short Notes On <ul style="list-style-type: none"> <li>• Repulsion Motor</li> <li>• AC Series Motor</li> </ul>	10	5	4
<b>Unit-IV</b>					
7	a.	Describe the various methods to find out voltage regulation in alternator	10	3	2
	b.	A 3-Phase, star connected, 1000KVA, 11000V alternator has rated current of 52.5 A. The ac resistance of the winding per phase is $0.45\Omega$ . The test results are given below- OC Test: Field Current = 12.5 A, Voltage between line = 422 V SC Test: Field Current = 12.5 A, Line current = 52.5 A Determine full load voltage regulation of the alternator for 0.8 p.f. leading and lagging.	10	3	4
<b>OR</b>					
8	a.	A 3-phase, 10-kVA, 400-V, 50-Hz, Y-connected alternator supplies the rated load at 0.8 p.f. lag. If arm. resistance is 0.5 ohm and syn. reactance is 10 ohms, find the power angle and voltage regulation	10	3	4
	b.	Discuss about the OCC and SCC in alternator and explain their importance	10	3	6
<b>UNIT-V</b>					
9	a.	What are the V curves of synchronous motor? What are the main characteristics of a synchronous motor?	10	4	4
	b.	A 3300V, 3 phase synchronous motor running at 1500 rpm has its excitation kept constant corresponding to no-load terminal voltage of 3000V. Determine the power input, power factor and torque developed for an armature current of 250A if the synchronous reactance is $5\Omega$ per phase and armature resistance is neglected.	10	4	4
<b>OR</b>					
10	a.	Why is synchronous motor not self starting? What methods are generally used to start the synchronous motors?	10	4	2
	b.	A 6600V, 3 phase, star connected synchronous motor draws a full load current of 80A at 0.8pf leading. The armature resistance is $2.2\Omega$ and reactance of $22\Omega$ per phase. If the stray losses of the machine are 3200w. Find (i) Emf induced (ii) Output power (iii) Efficiency of the machine.	10	4	4



Course Code: SOE-B-EE503					
O P JINDAL UNIVERSITY					
B. Tech. 5 <sup>th</sup> Semester Regular Examinations					
ELECTRICAL MACHINE-2					
(Offered to ELECTRICAL ENGINEERING (EE) (01UG060))					
Time: 3 Hrs.			Max. Marks: 100		
Answer any one question from each unit					
All questions carry equal marks					
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Unit-I ( 20 marks)					
1	a.	Write Short Notes on <ul style="list-style-type: none"> <li>• Torque-Speed Characteristic of 3 Phase Induction Motor</li> <li>• Power Stages in 3-Phase Induction Motor</li> <li>• Cogging and Crawling in 3-Phase Induction Motor</li> </ul>	20	1	2
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2	a.	Derive the relationship between the various torques in three phase induction motor.	10	1	3
	b.	An induction motor has an efficiency of 0.9 when the shaft load is 45 kW. At this load, stator ohmic loss and rotor ohmic loss each is equal to the iron loss. The mechanical loss is one-third of the no-load losses. Neglect ohmic losses at no-load. Calculate the sliP	10	1	3
Unit-II					
3	a.	A 20 KW, 400 V, 3 ph induction motor has full load efficiency and power factor of 0.86 and 0.88. Short circuit current at 200 V is 70 A. If motor is started by a star-delta starter, find: <ul style="list-style-type: none"> <li>• Ratio of starting to full load currents</li> </ul> Starting torque as a ratio of full load torque full load slip is 4%. On full load M/C is connected in delta.	10	1	3
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<b>OR</b>					
4	a.	Briefly discuss the various starting methods of 3-phase induction motor	10	2	6
	b.	A three phase, 4 pole, 1440 RPM, 50 Hz induction motor has star connected rotor winding with resistance 0.2 $\Omega$ /phase and standstill reactance of 1 $\Omega$ /phase. When stator is energized at rated voltage and frequency, the rotor induced emf at standstill is 120 $\Omega$ /phase. Calculate <ul style="list-style-type: none"> <li>• Rotor current, rotor power factor, torque at starting and full load and compare them.</li> <li>• If an external resistance 1 <math>\Omega</math>/phase is inserted in the rotor circuit, compute rotor power factor, torque at starting.</li> </ul>	10	2	3
Unit-III					
5	a.	Explain No load and blocked rotor test for single phase induction motor to determine equivalent parameters.	10	2	2




	b.	Explain construction, working principle of capacitor split phase single phase induction motor. Also draw the phasor diagram and torque-speed characteristic.	10	5	2
<b>OR</b>					
6	a.	Explain the double field revolving theory for the single phase induction motor and explain why this M/Cs are not self started. Also derive the expression for forward and backward slips.	10	5	2
	b.	Write Short Notes On <ul style="list-style-type: none"> <li>• Repulsion Motor</li> <li>• AC Series Motor</li> </ul>	10	5	4
<b>Unit-IV</b>					
7	a.	Describe the various methods to find out voltage regulation in alternator	10	3	2
	b.	A 3-Phase, star connected, 1000KVA, 11000V alternator has rated current of 52.5 A. The ac resistance of the winding per phase is $0.45\Omega$ . The test results are given below- OC Test: Field Current = 12.5 A, Voltage between line = 422 V SC Test: Field Current = 12.5 A, Line current = 52.5 A Determine full load voltage regulation of the alternator for 0.8 p.f. leading and lagging.	10	3	4
<b>OR</b>					
8	a.	A 3-phase, 10-kVA, 400-V, 50-Hz, Y-connected alternator supplies the rated load at 0.8 p.f. lag. If arm. resistance is 0.5 ohm and syn. reactance is 10 ohms, find the power angle and voltage regulation	10	3	4
	b.	Discuss about the OCC and SCC in alternator and explain their importance	10	3	6
<b>UNIT-V</b>					
9	a.	What are the V curves of synchronous motor? What are the main characteristics of a synchronous motor?	10	4	4
	b.	A 3300V, 3 phase synchronous motor running at 1500 rpm has its excitation kept constant corresponding to no-load terminal voltage of 3000V. Determine the power input, power factor and torque developed for an armature current of 250A if the synchronous reactance is $5\Omega$ per phase and armature resistance is neglected.	10	4	4
<b>OR</b>					
10	a.	Why is synchronous motor not self starting? What methods are generally used to start the synchronous motors?	10	4	2
	b.	A 6600V, 3 phase, star connected synchronous motor draws a full load current of 80A at 0.8pf leading. The armature resistance is $2.2\Omega$ and reactance of $22\Omega$ per phase. If the stray losses of the machine are 3200w. Find (i) Emf induced (ii) Output power (iii) Efficiency of the machine.	10	4	4

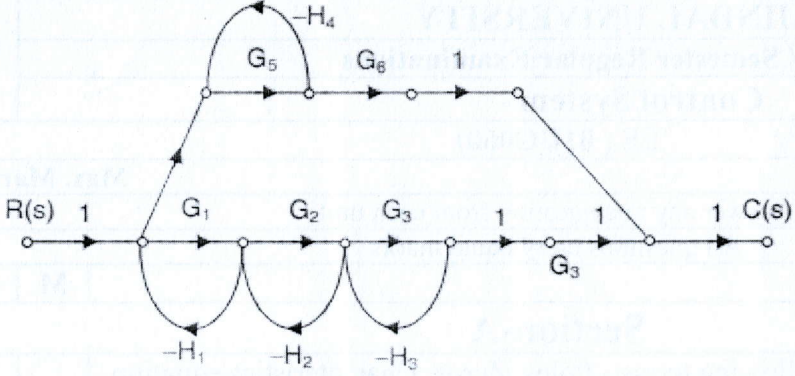
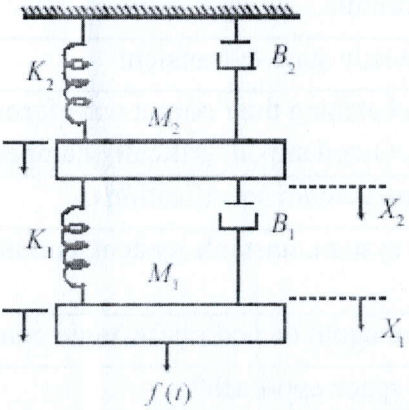
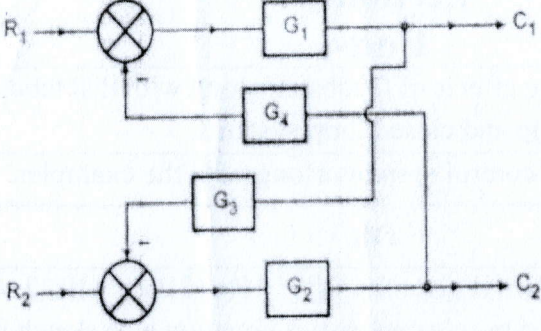


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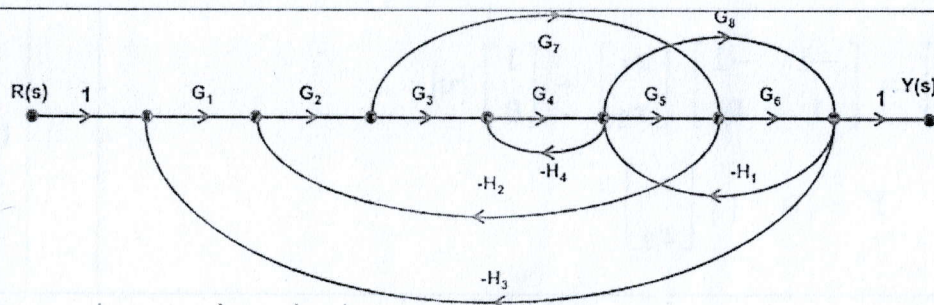
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Course Code: SOE-B-EE504						
O P JINDAL UNIVERSITY						
B. Tech. V Semester Regular Examinations						
Control System						
EE ( 01UG060)						
Time: 3 Hrs.		Max. Marks: 100				
Answer any one question from each unit						
All questions carry equal marks						
				M	CO	KL
<b>Section-A</b>						
1	a.	Define & explain the following terms:- Poles, Zeros, Characteristics equation, Order.	2	1	KL1	
	b.	What is the difference between linear & nonlinear control system.	2	1	KL1	
	c.	State & explains Mason's gain formula.	2	1	KL1	
	d.	What is the difference between steady state & transient	2	1	KL1	
	e.	Define the following systems by sketching their output waveforms for unit step input: Underdamped, undamped, Overdamped, critically damped systems.	2	1	KL1	
	f.	With neat sketch show all the time domain specifications.	2	1	KL1	
	g.	Distinguish the following: stable system, unstable system, conditionally stable and marginally stable systems.	2	5	KL1	
	h.	Define root locus along with the magnitude and phase angle conditions.	2	6	KL1	
	i.	What are the advantages of state space approach?	2	7	KL1	
	j.	Define the following: State, State variables, State vector, State trajectories.	2	7	KL1	
<b>Section-B:</b>						
<b>Unit-I</b>						
2	a.	What is a controller? Enlist the effects of feedback, along with that tabulate the comparison between open loop and closed loop systems.	8	1	KL1	
	b.	Explain the classifications of control systems along with the examples.	8	1	KL1	
<b>OR</b>						
3	a.	The transfer function of a system is given by $T(s) = \frac{10(s+8)}{s(s+4)(s^2+6s+25)}$ Obtain its poles, zeros, order, type, characteristics equation also sketch its pole zero plot.	8	5	KL1	
	b.	Distinguish between the following: 1) Linear & nonlinear control system 2) Feedback & feedforward control system 3) Open loop & closed loop control systems	8	4	KL1	
<b>Unit-II</b>						
4	a.	Find the transfer function of the above system by using signal flow graph	8	22	KL1	



	<p>method.</p> 			
b.	<p>Obtain the differential equations describing the complete dynamics of the mechanical system given below:-</p> 	8	2	KL1
<b>OR</b>				
5	<p>Find <math>C_2(s)/R_2(s)</math> &amp; <math>C_1(s)/R_1(s)</math> of the following system:</p> 	8	1	KL1
b.	<p>Determine the transfer function of the following system by using signal flow graph method: -</p>	8	2	KL1





### Unit-III

6	a.	A second order system is given by $C(s)/R(s)=25/s^2+6s+25$ . Find the rise time, peak time, peak overshoot and settling time if subjected to unit step input. Also calculate the expressions for its output response.	8	1	KL1
	b.	$S^6+4s^5+3s^4-16s^2-64s-48=0$ Find the number of roots of the equation with positive real part, zero real part and negative real part.	8	5	KL1

OR

7	a.	What is transient response? Derive the expressions for settling time, peak overshoot, rise time and delay time.	8	1	KL1
	b.	For a unity feedback system, $G(s)=K/s(s+4)(s+2)$ . Sketch the rough nature of root locus showing all the details on it. Comment on the stability of the system.	8	5	KL1

### Unit-IV

8	a.	For the transfer function given transfer function:- $G(s)H(s)=1/s(1+Ts)$ , obtain its polar plot.	8	6	KL1
	b.	For a certain control system $G(s)H(s)=K/s(s+10)(s+2)$ , Sketch the nyquist plot and hence calculate the range of values of K for stability.	8	6	KL1

OR

9	a.	Sketch the rough nature of polar plot for a system with $G(s)H(s)=10/s(s+1)(s+2)$ , Calculate its gain margin in dB. Hence comment on its stability.	8	6	KL1
	b.	Explain P, PI, PD & PID controllers along with diagram & features.	8	8	KL1

### UNIT-V

10	a.	Define the following terms:- State equations ,state trajectories, Eigen values, Eigen vectors, controllability, observability, rank of the matrix, also explain duality theorem.	8	7	KL1
	b.	A linear time invariant system is described by the following state variable model: test of its controllability & observability	8	7	KL1



$$\dot{x} = \begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -1 & -1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix} [u]$$

$$Y = [0 \quad 1] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

OR

	a.	What is state transition matrix? Enlist its properties.	8	7	KL1
	b.	Calculate the transfer function of the system represented by state model is given below: -			KL1
11	b.	$\dot{X} = \begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -1 & -1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \end{bmatrix} [u]$ $Y = [0 \quad 1] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$	8	7	



Course Code: SOE-B-EE505

**O P JINDAL UNIVERSITY**

**III Year B. Tech. V Semester Regular Examination**

**Analog Electronics**



**Time: 3 Hrs.**

**Max. Marks: 100**

Answer any one question from each unit

All questions carry equal marks

M	CO	KL
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**Unit-I ( 20 marks)**

1	a.	Define the following terms:- i) CMRR ii) input offset current iii) Bandwidth iv) input offset voltage	10	1	1
	b.	Compare the characteristics of ideal op-amp with practical op-amp (IC-741)	10	1	2

**OR**

2	a.	Draw the block diagram of internal construction of op-amp, and explain the function of each block in detail.	10	1	2
	b.	Why op-amps are used generally in closed loop configuration? Explain in detail with suitable example.	10	2	1

**Unit-II**

3	a.	Explain the working of inverting and non-inverting mode of op-amp. Derive the expression for voltage gain for both.	10	2	2
	b.	Determine the amplitude of output waveform for the closed loop inverting and non-inverting amplifier using op-amp with circuit diagram if $R_f = 34 \text{ k}\Omega$ and $R_i = 1.2 \text{ k}\Omega$ and input voltage is 30 mV sine wave. Also draw the output waveform for both.	10	2	4

**OR**

4	a.	Derive the output gain expression for capacitor coupled voltage follower circuit.	10	2	3
	b.	Derive the expression of voltage gain for instrumentation amplifier.	10	2	3

**Unit-III**

5	a.	Explain the following circuits: - i) Clipper ii) Clamper iii) Zero crossing detector.	10	3	2
	b.	A 20 mV, 5 kHz sine wave signal is applied to the inverting input terminal of an ideal op-amp differentiator circuit for which $R = 70 \text{ k}\Omega$ and $C = 5 \mu\text{F}$ . Determine the output voltage with waveform.	10	3	4

**OR**

6	a.	Explain the following circuits: - i) Peak detector ii) Voltage to Current converter iii) Schmitt trigger.	10	3	2
	b.	A 40 mV, 2 kHz sine wave signal is applied to the inverting input terminal of an ideal op-amp integrator circuit for which $R = 40 \text{ k}\Omega$ and $C = 4 \mu\text{F}$ . Determine the output voltage with waveform.	10	3	4

**Unit-IV**

7	a.	What is filter? Classify the filters. Draw the circuit diagram of second order low pass filter.	10	4	1
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	b.	What is the function of voltage regulator? Design a voltage regulator circuit using IC 7805, if input is domestic supply.	10	6	6
<b>OR</b>					
8	a.	Derive the expression for output frequency of gain for Wein bridge oscillator.	10	6	4
	b.	Design a voltage regulator using IC 723 for output voltage of 5 V.	10	6	6
<b>UNIT-V</b>					
9	a.	Draw the block diagram of PLL and explain the function of each block.	10	4	2
	b.	Design the circuit of IC-555 timer in astable mode and mono stable mode.	10	4	6
<b>OR</b>					
10	a.	List out the various A/D conversion techniques. Explain the working of single slope ADC.	10	5	2
	b.	Write short note on (any two):- i) bi-stable mode of IC-555 ii) Dual slope ADC iii) R/2R DAC	10	5	2



Course Code: SOE-B-EE 509

O P JINDAL UNIVERSITY

B. Tech. V Semester Regular Examinations

ELECTRIC VEHICLES



(Offered to EE)

Time: 2 Hrs.

Max. Marks: 20

M CO KL

**Section-A**

(Answer any FIVE questions)

1	a.	Define the hybrid Electric Vehicle?	2	1	3
	b.	Why Regenerative Braking used in Electric Vehicle?	2	2	4
	c.	Compare the conventional and hybrid electric vehicle?	2	1	2
	d.	What is concept of hybridization in hybrid vehicle?	2	1	1
	e.	What are the components of energy management system	2	3	1
	f.	What are the different energy storage systems used in Electric vehicle?	2	2	3
	g.	What is plug-in concept of Electric Vehicle?	2	4	5

**Section-B:**

(Each Question Carry 8 Marks)

**Unit-I**

2	Draw a general lay out of a EV and discuss the transmission characteristics.	8	2	4
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OR

3	Explain rolling resistance and aerodynamic drag in vehicles.	8	2	3
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**Unit-II**

4	What is the typical value for Induction Motors used in HEV applications?	8	3	5
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OR

5	Discuss in detail about the control of permanent magnet motor drives	8	3	3
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**Unit-III**

6	Dissect the configuration and control of Switched reluctance motor	8	5	2
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OR

7	Draw six different configurations of drivetrains in electric vehicles. Briefly explain each configuration.	8	5	4
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**Unit-IV**

8	What are different modes of charging batteries? Compare them in detail.	8	2	1
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OR



9	Explain fuel cell and flywheel as energy source elements in electric and hybrid electric vehicle	8	4	3
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**UNIT-V**

10	Why an energy management control system is required in an HEV? Do you think an elaborate energy management system similar to that applied to a hybrid vehicle, is required in an electric vehicle? Explain.	8	3	4
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**OR**

11	Classify and Explain the different energy management strategies	8	2	1
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<b>Course Code: SOE-B-ME501</b>						
<b>O P JINDAL UNIVERSITY</b>				<b>R 20</b>		
<b>B.Tech. V<sup>th</sup> Semester Regular Examinations</b>						
<b>THERMAL ENGINEERING</b>						
(Offered to ME)						
<b>Time: 3 Hrs.</b>		<b>Max. Marks: 100</b>				
Answer any one question from each unit						
All questions carry equal marks						
<b>Students are allowed to use the Steam tables</b>						
				<b>M</b>	<b>CO</b>	<b>KL</b>
<b>Section-A</b>						
<b>1</b>	a.	What is Mach number	2	1	1	
	b.	Draw the schematic diagram of CD nozzle indicating various section.	2	1	1	
	c.	Classify the steam turbine according to the action of steam.	2	2	2	
	d.	Define the degree of reaction with mathematical formula.	2	2	1	
	e.	What are the various types of power in steam turbine practice?	2	3	1	
	f.	Define the internal efficiency of steam turbine.	2	3	1	
	g.	State, how the air compressors are classified?	2	4	2	
	h.	What do you mean by multi-stage compression? State its advantages.	2	4	1	
	i.	State the major functions of the steam condensers.	2	5	1	
	j.	Write the working principle of cooling tower and classify cooling towers.	2	5	1	
<b>Section-B:</b>						
<b>Unit-I</b>						
<b>2</b>	a.	Show that the sonic velocity in an ideal gas depends on the temperature and the nature of the gas.	8	1	2	
	b.	Steam having pressure of 10.5 bar and 0.95 dryness is expanded through a convergent-divergent nozzle and the pressure of steam leaving the nozzle is 0.85 bar. Find the velocity at the throat for maximum discharge conditions. Index of expansion may be assumed as 1.135, Calculate mass rate of flow of steam through the nozzle.	8	1	3	
<b>OR</b>						
<b>3</b>	a.	A stream of air flows in a duct of 100 mm diameter at a rate of 1 kg/s. The stagnation temperature is 37 °C. At one section of the duct the static pressure is 40 kPa. Calculate the Mach number, Velocity, and stagnation pressure at this section.	8	1	2	
	b.	Find the expression for maximum discharge condition through steam nozzle.	8	1	1	
<b>Unit-II</b>						
<b>4</b>	a.	Explain the working of a single-stage impulse turbine with neat sketch. Also explain the pressure and velocity variations along the axial direction.	8	2	2	
	b.	A certain stage of a Parson's turbine consists of one row of fixed blades and one row of moving blades. The details of the turbine are as below: The mean diameter of the blades = 68 cm, R.P.M. of the turbine = 3000, The mass of steam passing per sec = 13.5 kg, Steam velocity at exit from fixed blades = 143.7 m/s, the blade outlet angle = 20°, Calculate the power developed in the stage and gross efficiency, assuming carry over coefficient as 0.74 and the efficiency of conversion of heat energy into kinetic energy in the blade channel is 0.92.	8	2	3	



**OR**

5	a.	In an impulse turbine the mean diameter of the blades is 1.05 m and the speed is 3000 rpm. The nozzle is inclined 18° to the plane of rotation, the ratio of blade speed to steam speed is 0.42, and the ratio of the relative velocity at outlet from the blades to that at inlet is 0.84. The outlet angle of the blade is to be made 3° less than the inlet angle. The steam flow is 10 kg/s. Draw the velocity diagram for the blades and derive the following (a) tangential thrust on the blade (b) axial thrust on the blades (c) resultant thrust on the blades (d) power developed in the blades	8	2	3
	b.	Distinguish between impulse and reaction turbines.	8	2	4

**Unit-III**

6	a.	Explain the state point locus and Reheat factor with the help of h-s curve.	8	3	2
	b.	Compare the throttle and Nozzle governing on various aspects.	8	3	2

**OR**

7	a.	What is the objective of steam turbine governing? Explain the nozzle governing in with schematic diagram.	8	3	1
	b.	In a three-stage steam turbine steam enters at 35 bar and 400°C and exhausts at 0.05 bar, 0.9 dry. If the work developed per stage is equal, determine: (i) Condition of steam at entry to each stage. (ii) The stage efficiencies. (iii) The reheat factor. (iv) Internal turbine efficiency. Assume condition line to be straight.	8	3	3

**Unit-IV**

8	a.	Show with a neat sketch the construction and working of a single-stage single-acting reciprocating air compressor.	8	4	2
	b.	Explain the surging, choking and stalling phenomenon in compressor.	8	4	2

**OR**

9	a.	A single-stage reciprocating compressor takes 1 m <sup>3</sup> of air per minute at 1.013 bar and 15°C and delivers it at 7 bar. Assuming that the law of compression is $pv^{1.35} = \text{constant}$ , and the clearance is negligible, calculate the indicated power.	8	4	3
	b.	Compare the centrifugal and axial flow compressor on various design and operational aspects.	8	4	2

**UNIT-V**

10	a.	What is the functional difference between boiler mountings and accessories? Explain any one of each type.	8	5	1
	b.	A vacuum of 710 mm of Hg was recorded in a condenser when the barometer reads 755 mm of Hg. The temperature of the condensate was 25 °C. Calculate the pressure of steam and air in the condenser and mass of air per kg of steam. Also, calculate the vacuum efficiency.	8	5	3

**OR**

11	a.	Explain the elements of steam condensing plant with neat sketch.	8	5	2
	b.	Explain the Cochran boiler with the help of neat sketch.	8	5	2



10:00 AM to 01:00 PM

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(53)

Course Code: SOE-B-ME502

**O P JINDAL UNIVERSITY****B. Tech. V<sup>th</sup> Semester Regular Examinations****Internal Combustion Engines****Offered to Mechanical Engineering**

Time: 3 Hrs.

Max. Marks: 100

Answer any one question from each unit

All questions carry equal marks

M CO KL

**Unit-I ( 20 marks)**

1	a.	Explain with a labelled diagram about a CI engine with respect to cycle of operation, type of ignition, fuel supply to the engine, Type of fuel used, Type of engine cooling and application with suitability.	16	1	V
	b.	Compare the 2S SI engine with a 4S SI engine for at least 4 points of differences.	4	1	V

**OR**

2	a.	Explain the valve timing for a 2S SI engine with a neat labelled diagram of the port arrangement in the cylinders.	10	1	V
	b.	How combustion achieved in a CI engine? (2) What is the role of fuel pump in a CI engine? (2) Elaborate on the desired characteristics of a suitable fuel for a CI engine and mention a few (at least 3) specific applications of CI engine (6)	10	1	I, I, VI

**Unit-II**

3	a.	What is meant by calorific value of a fuel? What is the impact of calorific value of fuel on the engine output?	5	2	I, I,
	b.	Discuss the principle, working and operation of a Bomb calorimeter or Junkers gas calorimeter with specific applications.	15	2	V

**OR**

4	a.	Explain the different stages of combustion in an SI engine with a P- $\theta$ diagram.	10	2	V
	b.	Explain the different stages of combustion in an CI engine with a P- $\theta$ diagram.	10	2	V

**Unit-III**

5	a.	List out some ideal qualities and characteristics of fuels used for combustion in IC engines and how do those qualities make it suitable for the combustion in IC engines (at least 6 points)? (6) Is hydrogen an ideal fuel? support your answer with suitable arguments. (4)	10	3	IV, I, I
	b.	List the qualities that make Petrol and Diesel the most widely used fuel for IC engines? (4) What are other alternative fuels used in IC engines? (2) What was the additive once widely used in IC engines to reduce knocking? (2) why was it banned? (2)	10	3	IV, I, I, I


**OR**

6	a.	With a neat labelled sketch, explain the construction working, limitations and applications of a simple carburetor used in SI engines.	16	3	V
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	b.	Define biofuels? List some commonly used biofuels used in IC engines?	4	3	I, V
<b>Unit-IV</b>					
7	a.	Explain the Willan's line method for determination of frictional power of an IC engine in detail with neat labelled diagram. (8) What are the other alternate methods to determine the frictional power in SI engines? (2)	10	4	V, I
	b.	What is Morse test? (2) List out the step-by-step procedure for the conduct of morse test. (8)	10	4	I, IV
<b>OR</b>					
8	a.	List out any 6 engine parameters that are measured and tested for performance testing of engines.	12	4	IV
	b.	Draw and explain with a neat labelled diagram about any one of the dynamometers to determine the brake power of an IC engine.	8	4	V
<b>UNIT-V</b>					
9	a.	With a neat labelled diagram, explain the parts and working of a magneto ignition system.	10	3	V
	b.	With a neat labelled diagram, explain the parts and working of a Battery ignition system.	10	3	V
<b>OR</b>					
10	a.	Discuss in detail about the environmental impacts of the excessive use of IC engines with respect to emissions. (6) Predict the future of IC engines based on current advancements in electric vehicle technology? Justify your answer with examples from the current global challenges faced by the IC engine industry. (6)	12	2	VI, I, VI
	b.	Interpret BHARAT and EURO series in context of engine emissions? what is the current version of BHARAT series implemented in India and what are its norms?	8	2	V, I



		Course Code: SOE-B-ME5032			
O P JINDAL UNIVERSITY					
B. Tech. V Semester Regular Examinations					
DYNAMICS OF MACHINE					
(Offered to ME)					
Time: 3 Hrs.		Max. Marks: 100			
Section A is compulsory					
Answer any one question from each unit					
		M	CO	KL	
<b>Section-A</b>					
1	a.	What is the significance of drawing the turning moment diagram?	2	1	1
	b.	Draw the turning moment diagram for 4 stroke Internal combustion engine.	2	1	1
	c.	What is the difference between centrifugal and inertia governors?	2	2	1
	d.	What is the gyroscopic couple? How its expression is obtained.	2	4	1
	e.	What is the condition for the stability of an automobile and how it is fulfilled?	2	4	1
	f.	What is the effect of rolling on a ship and the reason behind the same?	2	4	1
	g.	Classify and briefly describe the types of vibrations.	2	5	1
	h.	What is the magnification factor?	2	5	1
	i.	What is damped vibration? Name some equipment used for damping.	2	5	1
	j.	What is the difference between free and forced vibrations?	2	5	1
<b>Section-B:</b>					
<b>Unit-I</b>					
2	a.	Derive the Forces acting on the reciprocating parts of an engine, neglecting the weight of the connecting rod.	8	1	2
	b.	A shaft fitted with a flywheel rotates at 250 rpm and drives a machine. The torque of the machine varies in a cyclic manner over a period of 3 revolutions. The torque rises from 750 N-m to 3000 N-m uniformly during $\frac{1}{2}$ revolution and remains constant for the following revolution. It then falls uniformly to 750 N-m during the next $\frac{1}{2}$ revolution and remains constant for one revolution, the cycle being repeated thereafter. Determine the power required to drive the machine and percentage fluctuation in speed, if the driving torque applied to the shaft is constant and the mass of the flywheel is 500 kg with a radius of gyration of 600 mm.	8	1	3
<b>OR</b>					
3	a.	The crank and connecting rod of a petrol engine, running at 1800 rpm are 50 mm and 200 mm respectively. The diameter of the piston is 80 mm and the mass of the reciprocating parts is 1 kg. At a point during the power stroke, the pressure on the piston is $0.7 \text{ N/mm}^2$ , where it has moved 10 mm from the IDC. Determine (i) the net load on the Gudgeon Pin, (ii) thrust in the connecting rod, (iii) the reaction between piston and cylinder, and (iv) the engine speed at	8	1	3



		which the above values become zero.			
	b.	The turning moment diagram for a multi-cylinder engine has been drawn to a scale of 1 mm to 600 N-m torque and 1 mm to 6° of crank displacement. The intercepted areas between the output torque curve and mean resistance line taken in order from one end, in sq. mm are -30, +410, -280, +320, -330, +250, -360, +280, -260 sq. mm, when the engine is running at 1000 rpm. The engine has a stroke of 300 mm, and the fluctuation of speed is not to exceed $\pm 2\%$ of the mean speed. Determine a suitable diameter and cross-section of the flywheel rim for a limiting value of the safe centrifugal stress of 7 MPa. Also, construct the T- $\Theta$ diagram. The material density may be assumed as 7200 kg/m <sup>3</sup> . The width of the rim is to be 5 times the thickness.	8	1	3
<b>Unit-II</b>					
	a.	Explain the following terms related to the governor: (i) Effort of Governor (ii) Power of the Governor (iii) Hunting, and (iv) Controlling Force	8	2	2
4	b.	The following particulars refer to a Proell Governor with open arms. Length of all arms = 180 mm, Distance of pivot arms from the axis of rotation 30 mm. Length of extension of lower arms to which each ball is attached = 80 mm, the mass of each ball 8 kg, the mass of central load 120 kg, radius of rotation of balls 160 mm. When the arms are inclined at an angle of 40° to the axis of rotation, find (i) the equilibrium speed (ii) the coefficient of insensitiveness if the friction of the mechanism is equivalent to 30 N & (iii) the Range of speed when the governor is inoperative.	8	2	3
<b>OR</b>					
5	a.	In a Porter Governor, the upper and lower arms are each 250 mm long and are pivoted on the axis of rotation. The mass of each rotating ball is 3 kg and the mass of the sleeves is 20 kg. The sleeve is in its lowest position when the arms are inclined at 30° to the governor axis. The lift of the sleeve is 36 mm. Find the force of friction at the sleeve, if the speed at the moment it rises from the lowest position is equal to the speed at the moment it falls from the highest position. Also, find the range of speed of the governor.	8	2	2
	b.	In a Hartnell governor, the radius of rotation of the balls is 60 mm at the minimum speed of 240 rpm. The length of the ball arm is 130 mm and the sleeve arm is 80 mm. The mass of each ball is 3 kg and the sleeve is 4 kg. The stiffness of the spring is 20 N/mm. Determine the (i) speed when the sleeve is lifted by 50 mm, (ii) initial compression of the spring, (iii) governor effort, and (iv) Power.	8	2	3
<b>Unit-III</b>					
6	a.	Describe the Gyroscopic effect on Aero planes taking a left turn and right turn. Also, describe the Gyroscopic effect on Ships considering steering and	8	4	3



		pitching. Draw a suitable sketch and vector diagram wherever required.			
	b.	A uniform disc of 150 mm diameter has a mass of 5 kg. It is mounted centrally in bearings which maintain its axle in a horizontal plane. The disc spins about its axle with a constant speed of 1000 rpm while the axle precesses uniformly about the vertical at 60 rpm in an anticlockwise direction when viewed from the top. If the distance between the bearings is 100 mm, find the resultant reaction at each bearing due to the mass and gyroscopic effects. Assuming the direction of rotation of the disc to be anticlockwise when viewed from the right end bearing.	8	4	3

**OR**

7	a.	The turbine rotor of a ship has a mass of 3500 kg. It has a radius of gyration of 0.45 m and a speed of 3000 rpm clockwise when looking from the stern. Determine the gyroscopic couple and its effect on the ship. (i) When the ship is steering to the left on a curve of 100 m radius at a speed of 36 km/h. (ii) When the ship is pitching in a simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 40 seconds and the total angular displacement between the two extreme positions of pitching is 12°. Also, find maximum angular acceleration during pitching. (iii) When the ship is rolling.	8	4	2
	b.	A 2.2-tonne racing car has a wheelbase of 2.4 m and a track of 1.4 m. The center of mass of the car lies at 0.6 m above the ground and 1.4 m from the rear axle. The equivalent mass of engine parts is 140 kg with a radius of gyration of 150 mm. The back axle ratio is 5. The engine shaft and flywheel rotate clockwise when viewed from the front. Each wheel has a diameter of 0.8 m and a moment of inertia of 0.7 kg-m <sup>2</sup> . Determine the load distribution on the wheels when the car is rounding a curve of 100 m radius at a speed of 72 km/h to the right.	8	4	3

**Unit-IV**

8	a.	Derive the expression for the natural frequency of free longitudinal vibration by the Equilibrium method, Energy method, and Rayleigh's method.	8	5	2
	b.	In a single degree damped vibrating system, a suspended mass of 8 kg makes 30 oscillations in 18 seconds. The amplitude decreases to 0.25 of the initial value after 5 oscillations. Determine the (i) Stiffness of the spring (ii) logarithmic decrement (iii) damping factor and (iv) damping coefficient.	8	5	2

**OR**

9	a.	What is the forced damped vibration? Derive the expression for the amplitude of vibration using a graphical method.	8	5	2
	b.	Explain Vibration Isolation and Transmissibility. A machine part having a mass of 2.5 kg vibrates in a viscous medium. A harmonic exciting force of 30 N acts on the part and causes a resonant	8	5	3



		amplitude of 14 mm with a period of 0.22 sec. Find the damping coefficient. If the frequency of the exciting force is changed to 4 Hz, determine the increase in the amplitude of the forced vibrations upon the removal of the damper.			
<b>UNIT-V</b>					
10	a.	Explain the balancing of several masses rotating in the same plane by either the analytical method or the graphical method.	8	3	2
	b.	Four masses $m_1$ , $m_2$ , $m_3$ , and $m_4$ are 200 kg, 300 kg, 240 kg, and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m, and 0.3 m respectively and the angles between successive masses are $45^\circ$ , $75^\circ$ , and $135^\circ$ . Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m.	8	3	3
<b>OR</b>					
11	a.	Explain the balancing of several masses rotating in different planes.	8	3	2
	b.	A shaft carries four masses A, B, C, and D of magnitude 200 kg, 300 kg, 400 kg, and 200 kg respectively, and revolving at radii 80 mm, 70 mm, 60 mm, and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the crank measured anticlockwise are A to B $45^\circ$ , B to C $70^\circ$ and C to D $120^\circ$ . The balancing masses are to be placed in planes X and Y. The distance between planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions.	8	3	3



Course Code: SOE-B-ME504

**O P JINDAL UNIVERSITY**

**B. Tech. V Semester Regular Examinations**

**Operation Research Techniques**

(Offered to ME)

**Time: 3 Hrs.**

**Max. Marks: 100**

**M CO KL**

**Section-A**

1	a.	Define an objective function	2	1	1
	b.	Write down the steps of VAM method.	2	2	1
	c.	In a PERT network the activity time is assumed to follow which types of distribution?	2	3	1
	d.	What do you mean by penalty and how it is being calculated in transportation problem?	2	2	2
	e.	Draw the graph of ordering cost, holding cost and total cost of inventory.	2	4	1
	f.	Arrival rate in queuing theory is assumed to be which type of distribution?	2	4	1
	g.	What do you mean by cost slop and how it is being used in crashing of a network?	2	3	2
	h.	Define Economic Order Quantity.	2	4	1
	i.	Draw the graph of quantity vs time for production consumption model.	2	4	1
	j.	What do you mean by principle of dominance and how it is being used in game theory?	2	5	1

**Section-B:**

**Unit-I**

2	a.	Solve the following LPP using simplex algorithm  Minimize $C = 2X_1 + 4X_2$ Subjected to $2X_1 + X_2 \leq 14$ $X_1 + 3X_2 \leq 18$ $X_1 + X_2 \leq 2$ $X_1, X_2 \geq 0$	8	1	2																																
	b.	Find out the initial solution by NWCR method and optimal solution by MODI method of the following transportation problem. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2"></th> <th colspan="4">Destinations</th> <th></th> </tr> <tr> <th colspan="2"></th> <th>A</th> <th>B</th> <th>C</th> <th>D</th> <th>Capacity</th> </tr> </thead> <tbody> <tr> <th rowspan="3">Origin</th> <th>1</th> <td>1</td> <td>5</td> <td>3</td> <td>3</td> <td>34</td> </tr> <tr> <th>2</th> <td>3</td> <td>3</td> <td>1</td> <td>2</td> <td>15</td> </tr> <tr> <th>3</th> <td>0</td> <td>2</td> <td>2</td> <td>3</td> <td>12</td> </tr> </tbody> </table>			Destinations							A	B	C	D	Capacity	Origin	1	1	5	3	3	34	2	3	3	1	2	15	3	0	2	2	3	12	8	2
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	3	0	2	2	3	12																															



			4	2	7	2	4	19			
			Demand	21	25	17	17	80			

**OR**

3	a.	Maximize $Z = 2X_1 + X_2$ Subjected to $X_1 + 2X_2 \leq 10$ $X_1 + X_2 \leq 6$ $X_1 - X_2 \leq 2$ $X_1, X_2 \geq 0$	8	1	2																													
	b.	To stimulate interest and provide an atmosphere for intellectual discussion, the faculty of mathematical sciences in an institute decides to hold special seminars on four contemporary topics – Statistics, Operations Research, Discrete Mathematics, Matrices. Each such seminar is to be held once a week. However, scheduling these seminars (one for each topic and not more than one seminar per day) has to be done carefully so that the number of students unable to attend is kept to a minimum. A careful study indicates that the number of students who cannot attend a particular seminar on a specific day is as follows: <table border="1" style="margin: 10px auto;"> <thead> <tr> <th></th> <th>Statistics</th> <th>Operation Research</th> <th>Discrete Matrices</th> <th>Matrices</th> </tr> </thead> <tbody> <tr> <td>Monday</td> <td>50</td> <td>40</td> <td>60</td> <td>20</td> </tr> <tr> <td>Tuesday</td> <td>40</td> <td>30</td> <td>40</td> <td>30</td> </tr> <tr> <td>Wednesday</td> <td>60</td> <td>20</td> <td>30</td> <td>20</td> </tr> <tr> <td>Thursday</td> <td>30</td> <td>30</td> <td>20</td> <td>30</td> </tr> <tr> <td>Friday</td> <td>10</td> <td>20</td> <td>10</td> <td>30</td> </tr> </tbody> </table> Find an optimal schedule for the seminars		Statistics	Operation Research	Discrete Matrices	Matrices	Monday	50	40	60	20	Tuesday	40	30	40	30	Wednesday	60	20	30	20	Thursday	30	30	20	30	Friday	10	20	10	30	8	2
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**Unit-II**

4	a.	There are 5 jobs, each of which has to go through the machines A and B in the order AB. The processing times (in hours) are given as <table border="1" style="margin: 10px auto;"> <thead> <tr> <th>Job</th> <th>J1</th> <th>J2</th> <th>J3</th> <th>J4</th> <th>J5</th> </tr> </thead> <tbody> <tr> <td>Machine A</td> <td>2</td> <td>4</td> <td>5</td> <td>7</td> <td>1</td> </tr> <tr> <td>Machine B</td> <td>3</td> <td>6</td> <td>1</td> <td>4</td> <td>8</td> </tr> </tbody> </table> Determine a sequence of these jobs that will minimize the total elapsed time T. Also obtain: <ol style="list-style-type: none"> <li>a. The minimum elapsed time; and</li> <li>b. The idle time for each of the machines.</li> </ol>	Job	J1	J2	J3	J4	J5	Machine A	2	4	5	7	1	Machine B	3	6	1	4	8	8	1	3
	Job	J1	J2	J3	J4	J5																	
Machine A	2	4	5	7	1																		
Machine B	3	6	1	4	8																		
b.	A small project is composed of seven activities whose time estimates are listed as follow: <table border="1" style="margin: 10px auto;"> <thead> <tr> <th rowspan="2">Activity</th> <th colspan="3">Estimated Duration (weeks)</th> </tr> <tr> <th>Optimistic</th> <th>Most likely</th> <th>Pessimistic</th> </tr> </thead> <tbody> <tr> <td>1-2</td> <td>1</td> <td>1</td> <td>7</td> </tr> <tr> <td>1-3</td> <td>1</td> <td>4</td> <td>7</td> </tr> </tbody> </table>	Activity	Estimated Duration (weeks)			Optimistic	Most likely	Pessimistic	1-2	1	1	7	1-3	1	4	7	8	3	2				
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1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

You are required to:

- (I) Draw the project network.  
 (II) Calculate the expected project length.

**OR**

5	a.	<p>Task A, B, C, ..., H, I constitute a project. The precedence relationship are A&lt;D; A&lt;E; B&lt;F; D&lt;F; C&lt;G; C&lt;H; F&lt;I; G&lt;I.</p> <p>Draw a network to represent the project and find the minimum time of completion of the project when time, in days, of each task are as follow:</p> <table border="1"> <tr><td>Task</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td><td>G</td><td>H</td><td>I</td></tr> <tr><td>Time</td><td>8</td><td>10</td><td>8</td><td>10</td><td>16</td><td>17</td><td>18</td><td>14</td><td>9</td></tr> </table> <p>Also identify the critical path</p>	Task	A	B	C	D	E	F	G	H	I	Time	8	10	8	10	16	17	18	14	9	8	1	2			
	Task	A	B	C	D	E	F	G	H	I																		
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b.	<p>There are seven jobs, each of which has to go through the machine A and B in the order AB. Processing time in hours are as</p> <table border="1"> <tr><td>Job</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr> <tr><td>A</td><td>3</td><td>12</td><td>15</td><td>6</td><td>10</td><td>11</td><td>9</td></tr> <tr><td>B</td><td>8</td><td>10</td><td>10</td><td>6</td><td>12</td><td>1</td><td>3</td></tr> </table> <p>Determine a sequence of these jobs that will minimize the total elapse time. Also find total elapse time and idle time for machine A and B.</p>	Job	1	2	3	4	5	6	7	A	3	12	15	6	10	11	9	B	8	10	10	6	12	1	3	8	3	2
Job	1	2	3	4	5	6	7																					
A	3	12	15	6	10	11	9																					
B	8	10	10	6	12	1	3																					

**Unit-III**

6	a.	What do you mean by inventory cost? Explain each type of cost associated with inventory	8	4	2
	b.	<p>ABC Co. manufactures a subcomponent at the rate of 400 per day when required. Its annual demand for this item is 50000 units. Assume 250 working days per year. Holding cost is \$10 per unit per year. Set-up cost is 600 per set-up. Find:</p> <p>a. Economic production quantity.          b. What will be the maximum inventory level?</p> <p>How many production runs will be made per year?</p>	8	4	3

**OR**

7	a.	<p>ABC Ltd. uses EOQ logic to determine the order quantity for its various components and is planning its orders. The Annual consumption is 80,000 units, Cost to place one order is Rs. 1,200, Cost per unit is Rs. 50 and carrying cost is 6% of Unit cost. Find</p> <p>a. EOQ,          b. No. of orders per year.</p>	8	4	3
	b.	<p>Tiger Corporation purchases 1,240,000 units per year of one component. The fixed cost per order is \$27. The annual carrying cost of the item is 26.7% of its \$2.04 cost. Determine the EOQ.</p>	8	4	3

**Unit-IV**

8	a.	In a car repair service centre, the car is coming at the rate of 5 car per hours and	8	4	2
---	----	--	---	---	---



		on an average a car is taking 10 minutes to be served. What is the probability that there are at most 2 cars in the system?			
	b.	A supermarket has a single counter, serving customers. The customers arrive in a Poisson fashion at the rate of 12 per hour. The service time for each customer is exponential with mean 6 minutes. Find a. The probability that an arriving customer has to wait for the service. b. The average number of customers in the system. and c. The average time spent by a customer in the super-market.	8	4	2

**OR**

9	a.	Train arrives at the yard every 15 minutes and the service time is 33 minutes. If the line capacity of the yard is limited to 1 train, find i. The probability that the yard is empty j. The average number of trains in the system.	8	4	2
	b.	Job arrives at a facility at an average rate of 5 in an 8 hours shift. The arrival of the job follow poisson distribution. The average service time of a job on the facility is 40 minutes. The service time follow exponential distribution. What will be the Ideal time at the facility per shift?	8	4	2

### UNIT-V

10	a.	A company is currently involved in negotiations with its union on the upcoming wage contract. The positive sign in table represents wage increase while negative sign represents wage reduction. What are the optimal strategies for the company as well as the union? What is the game's value?	8	5	2																																		
		<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2" rowspan="2"></th> <th colspan="4">Union Strategy</th> </tr> <tr> <th>U1</th> <th>U2</th> <th>U3</th> <th>U4</th> </tr> </thead> <tbody> <tr> <th rowspan="4" style="writing-mode: vertical-rl; transform: rotate(180deg);">Company Strategy</th> <th>C1</th> <td>0.25</td> <td>0.27</td> <td>0.35</td> <td>-0.02</td> </tr> <tr> <th>C2</th> <td>0.20</td> <td>0.16</td> <td>0.08</td> <td>0.08</td> </tr> <tr> <th>C3</th> <td>0.14</td> <td>0.12</td> <td>0.15</td> <td>0.13</td> </tr> <tr> <th>C4</th> <td>0.30</td> <td>0.14</td> <td>0.19</td> <td>0.00</td> </tr> </tbody> </table>						Union Strategy				U1	U2	U3	U4	Company Strategy	C1	0.25	0.27	0.35	-0.02	C2	0.20	0.16	0.08	0.08	C3	0.14	0.12	0.15	0.13	C4	0.30	0.14	0.19	0.00			
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	b.	Reduce the following game by dominance property and solve it:	8	5	2																																		
		<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2" rowspan="2"></th> <th colspan="5">Player B</th> </tr> <tr> <th>I</th> <th>II</th> <th>III</th> <th>IV</th> <th>V</th> </tr> </thead> <tbody> <tr> <th rowspan="4" style="writing-mode: vertical-rl; transform: rotate(180deg);">Player A</th> <th>I</th> <td>1</td> <td>3</td> <td>2</td> <td>7</td> <td>4</td> </tr> <tr> <th>II</th> <td>3</td> <td>4</td> <td>1</td> <td>5</td> <td>6</td> </tr> <tr> <th>III</th> <td>6</td> <td>5</td> <td>7</td> <td>6</td> <td>5</td> </tr> <tr> <th>IV</th> <td>2</td> <td>0</td> <td>6</td> <td>3</td> <td>1</td> </tr> </tbody> </table>						Player B					I	II	III	IV	V	Player A	I	1	3	2	7	4	II	3	4	1	5	6	III	6	5	7	6	5	IV	2	0
		Player B																																					
		I	II	III	IV	V																																	
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	II	3	4	1	5	6																																	
	III	6	5	7	6	5																																	
	IV	2	0	6	3	1																																	

**OR**

11	a.	Solve the following game by using the principle of dominance:	8	5	2																								
		<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2" rowspan="2"></th> <th colspan="6">Player B</th> </tr> <tr> <th>I</th> <th>II</th> <th>III</th> <th>IV</th> <th>V</th> <th>VI</th> </tr> </thead> <tbody> <tr> <th rowspan="2" style="writing-mode: vertical-rl; transform: rotate(180deg);">Pla</th> <th>1</th> <td>4</td> <td>2</td> <td>0</td> <td>2</td> <td>1</td> <td>1</td> </tr> <tr> <th>2</th> <td>4</td> <td>3</td> <td>1</td> <td>3</td> <td>2</td> <td>2</td> </tr> </tbody> </table>						Player B						I	II	III	IV	V	VI	Pla	1	4	2	0	2	1	1	2	4
		Player B																											
		I	II	III	IV	V	VI																						
Pla	1	4	2	0	2	1	1																						
	2	4	3	1	3	2	2																						



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				3	4	3	7	-5	1	2				
				4	4	3	4	-1	2	2				
				5	4	3	3	-2	2	2				
b.		A and B Play a game in which each has three coins a 5p, a 10p and a 20p. Each player selects a coin without the knowledge of the other choice. If the sum of the coins is an odd amount A wins B's coin; if the sum is even B wins A's coin. Find the best strategy for each player and the value of the game.										8	5	3



1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10

A card is drawn from a pack of 52 cards. Find the probability that the card is a heart or a king.

Solution: Let  $A$  be the event that the card is a heart and  $B$  be the event that the card is a king.

Then  $P(A) = \frac{13}{52}$ ,  $P(B) = \frac{4}{52}$ , and  $P(A \cap B) = \frac{2}{52}$ .

Therefore,  $P(A \cup B) = P(A) + P(B) - P(A \cap B) = \frac{13}{52} + \frac{4}{52} - \frac{2}{52} = \frac{15}{52}$ .

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Course Code: SOE-B-ME505						
O P JINDAL UNIVERSITY				R 20		
I B. Tech. V Semester Regular Examinations						
MECHATRONICS						
Time: 3 Hrs.		Max. Marks: 100				
Answer any one question from each unit						
All questions carry equal marks						
				M	CO	KL
Section-A						
1	a.	Define Mechatronics. List the applications of Mechatronics in day to day activities.	2	1	L1	
	b.	Explain the logic of AND and OR gates, used in operation of pneumatic circuits, with symbol.	2	3	L2	
	c.	Explain briefly the difference between microprocessor and microcontroller	2	2	L2	
	d.	How do you abbreviate PLCs? What is its uniqueness?	2	2	L1	
	e.	Explain the operation of a check valve with a neat sketch	2	3	L2	
	f.	What are the advantages and disadvantages of closed-loop control System?	2	4	L1	
	g.	What is Routh Hurwitz Stability Criterion?	2	5	L1	
	h.	Briefly differentiate between Bode and polar Plot?	2	5	L2	
	i.	What is order and type of the system. Explain with example	2	4	L1	
	j.	What are the standard test signals? Briefly explain with sketch	2	4	L1	
Section-B:						
Unit-I						
2	a.	Draw a block diagram of Programmable Logic Controller (PLC) showing in very general terms the main units of it.	8	2	L1	
	b.	Explain the important features of a typical programmable logic controller (PLC)	8	2	L2	
OR						
3	a.	Describe how to select a specific microcontroller for a given application. Briefly give different applications of 8051 microcontroller.	8	2	L4	
	b.	Explain the pin description of 8085 with sketch.	8	2	L2	
Unit-II						
4	a.	Construct 'meter in' and 'meter out' circuits for the speed control of hydraulic cylinder.	8	3	L3	
	b.	Explain the structure of a pneumatic control system, with a neat sketch.	8	3	L2	
OR						
5	a.	Develop an electro-pneumatic circuit by cascade method for the following sequence: A+B+A-B-, where A and B stands for cylinder. + indicates extension and - indicates retraction of cylinders. Explain the Circuit in details.	16	3	L6	







### Unit-III

6	a.	Discuss Mechatronics approach in a microprocessor controlled engine management system.	8	1	L4
	b.	Discuss Mechatronics design process. Compare the traditional design to mechatronics design.	8	1	L2

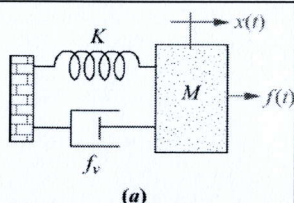
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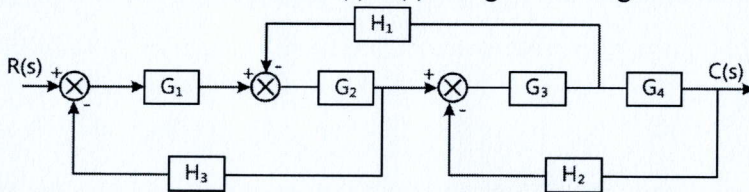
7	a.	Discuss Mechatronics approach in a microprocessor controlled washing machine	8	1	L4
	b.	Explain the key elements of Mechatronics System with neat sketch.	8	1	L2

### Unit-IV

8	a.	Derive steady state error? Derive the static error components for Type 0, Type 1 & Type 2 systems?	8	4	L3
	b.	Draw the step responses of a standard second order undamped, under damped and critically damped system. Also show pole locations of these systems.	8	4	L3

OR

9	a.	Determine the range of k for stable system. $s^4 + 4s^3 + 4s^2 + 3s + k = 0$	5	5	L3	
	b.	Find the transfer function, $X(s)/F(s)$ , for the system in given Figure	 <p style="text-align: center;">(a)</p>	5	4	L2
	b.	Find the transfer function $C(s)/R(s)$ using block diagram reduction technique.		6	4	L2



### UNIT-V

10	a.	The control system having unity feedback has $G(s) = \frac{20}{s(1+4s)(1+s)}$ ; Determine: a) Different static error coefficients b) Steady State error if input $r(t) = 2 + 4t + \frac{t^2}{2}$	8	4	L3
	b.	Using Rouths stability criterion, determine the number of roots on imaginary axis for the system: $s^6 + 4s^5 + 3s^4 - 16s^2 - 64s - 48 = 0$ and comment on stability of given system.	8	5	L3

OR

11	a.	Draw the root locus for the system $G(s)H(s) = \frac{k}{s(s+3)(s+6)}$ ; obtain value of k when $\xi$ is 0.6 from root locus. Show all the salient point on the graph paper.	16	5	L3
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Course Code: SOE-B-ME510							
O P JINDAL UNIVERSITY					R 20		
I B. Tech. V Semester Regular Examinations							
Electric Vehicle Design and Development (Offered to Mechanical)							
Time: 3 Hrs.			Max. Marks: 100				
Answer any one question from each unit							
All questions carry equal marks							
					M	CO	KL
<b>Section-A</b>							
1	a.	What do you mean by a chassis?	2	1	1		
	b.	What type of spring is normally used with solid axle beams?	2	1	1		
	c.	Why do tyres have tread pattern?	2	2	1		
	d.	What is the function of DC-DC converter?	2	1	1		
	e.	Name various components mounted on the chassis frame.	2	1	1		
	f.	What is adhesion limit?	2	2	1		
	g.	Define king pin inclination.	2	2	1		
	h.	What are the differences between EV and IC engine?	2	1	1		
	i.	State factor of wheel alignment?	2	5	1		
	j.	What are the major components included in automobile air-conditioning? Which refrigerant is used in an automobile air-conditioning?	2	5	1		
<b>Section-B</b>							
<b>Unit-I</b>							
2	a.	Write working principal of battery management system.	8	4	2		
	b.	Briefly explain Electronic Control unit.	8	2	2		
<b>OR</b>							
3	a.	Briefly explain vehicle resistance in electric vehicles	8	4	2		
	b.	Explain performance characteristics of electric motors for traction?	8	2	2		
<b>Unit-II</b>							
4	a.	Explain the term: camber, caster, steering axis inclination and toe-in. what are the effect of each on the steering characteristics of a vehicle?	10	2	4		
	b.	Discuss different tyre-carcass types and the materials used for them. Compare the radial and bias ply type carcass tyres.	6	2	2,4		
<b>OR</b>							
5	a.	Draw a simplified wiring circuit for the lighting system of car and discuss the same.	10	2	3		
	b.	Discuss a steering linkage for a vehicle with independent suspension.	6	2	3		
<b>Unit-III</b>							
6	a.	What are the loads coming on a chassis frame? What is the effect of weight of vehicle and passenger	8	3	2		
	b.	What type of stresses are produced in the side member while cornering?	8	3	2		



<b>OR</b>					
7	a.	Describe briefly the following types of frames: (i) Conventional Frame (ii) Semi-integral frame (iii) Integral or unit frame.	10	3	3
	b.	Define the following term: (i) Wheel base, (ii) Front and rear overhang and (iii) Wheel track	6	3	3
<b>Unit-IV</b>					
8	a.	Give the description of a telescopic damper, with neat sketches.	8	4	2
	b.	Describe the MacPherson strut assembly of independent suspension system with neat sketch?	8	4	3
<b>OR</b>					
9	a.	Derive an equation of motion for vehicle vibration with single degree of vibration (damped and undamped both).	8	4	2
	b.	Explain briefly wishbone arm independent suspension system used in automobile.	8	4	3
<b>UNIT-V</b>					
10	a.	Briefly explain Battery pack layout? Explain Battery Parameters?	8	5	3
	b.	Features and benefits of electric vehicle control module (EVCM).	8	5	3
<b>OR</b>					
11	a.	What are the charging protocols and standards?	8	5	3
	b.	Describe safety and performance optimization of electric vehicle control module (EVCM).	8	5	3



Course Code: SOE-B-MME501

**O P JINDAL UNIVERSITY**  
**B. Tech. V Semester Regular Examinations**  
**Melting & Casting Technology**



Time: 3 Hrs.

Max. Marks: 100

Answer any one question from each unit  
 All questions carry equal marks

M CO KL

**Section-A**

1	a.	Mention the name of sands and at least one type of resin used to prepare shell mold.	2	1	1
	b.	On increasing the pattern temperature, thickness of the shell increases or decreases? Why?	2	1	1
	c.	Define: stuccoing and soldering	2	1	1
	d.	What is the basic difference between hot and cold chamber pressure die casting? Why plunger type pressure die casting was developed?	2	1	1
	e.	During metal casting of a slab, show how the thickness 'T' of a solid formed after time 't' are related to each other?	2	1	3
	f.	What is the gating ratio for pressurized and unpressurized gating system?	2	1	1
	g.	What is hall patch relation?	2	1	1
	h.	What is chvorinov's rule?	2	1	1
	i.	What is the purpose of flux?	2	1	1
	j.	What is aspiration effect?	2	1	1

**Section-B:**  
**Unit-I**

2	a.	Explain constitutional supercooling with diagram.	8	1	5
	b.	The solidification time for a cube casting having 5 cm side is 10 minute. Under similar conditions of heat transfer what will be the solidification time in minutes for a cube casting having 10 cm side?	8	2	3

OR

3	a.	In a sand casting of rectangular sand, the thickness of the solidification layer after 2 minutes is known to be 3 cm. Based on Chvorinov's rule, calculate the solidified thickness (in cm) after 4 minutes.	8	2	3
	b.	For casting a cylindrical bloom having a length of 1000 mm and dia of 750 mm, what would be the approximate solidification time (in minutes) by using Chvorinov's rule when the mold constant is 2 sec/mm <sup>2</sup> ?	8	2	3

**Unit-II**

4	a.	Discuss the pattern allowances in detail.	8	1	6
	b.	Discuss in detail the testing methods of molding sands.	8	1	6

OR



5	a.	Discuss in details the different types of patterns.	8	1	6
	b.	What are cores and chaplets. Name the types of cores based on their position.	8	1	1
<b>Unit-III</b>					
6	a.	Explain shell molding and investment molding process.	8	1	5
	b.	Explain die casting process.	8	1	5
<b>OR</b>					
7	a.	Define gates. How the gating system is designed? Name the defects occur due to improper design of gating system.	8	1	1
	b.	Define gating ratio. Why it is important? How pressurized gating systems are different from unpressurized gating system?	8	1	1
<b>Unit-IV</b>					
8	a.	What are the causes of mismatch defect, warping defect, pin hole and blow hole defects? How they can be eliminated?	8	3	1
	b.	Discuss hot tears, misrun, rat tails and buckle defects in the casting.	8	3	6
<b>OR</b>					
9	a.	Discuss in detail the liquid penetrant testing method.	8	3	6
	b.	What is fettling process? What are the different stages of fettling process?	8	3	1
<b>UNIT-V</b>					
10	a.	Explain directional solidification.	8	1	5
	b.	Discuss in detail the segregation defect.	8	1	6
<b>OR</b>					
11	a.	<b>State True or False</b> i. Zinc is used as an additive in core making. ii. Backelite not used as binders for mold materials. iii. Green sand mold contains high strength. iv. Venting is a process which allows molten metal to compensate for its liquid and solidification shrinkage. v. Casting is the most versatile process in manufacturing. vi. Excessive moisture eases the making and baking of cores. vii. Runners are used to compensate the shrinkage during solidification. viii. Streamlining results in reduction of metal turbulence.	8	1	5
	b.	Define: nucleation, homogeneous solidification, heterogeneous solidification, growth, choke, green shear strength, green compressive strength and cores.	8	1	1



Course Code: SOE-B-MME502

O P JINDAL UNIVERSITY

B. Tech. V Semester Regular Examinations

STEEL MAKING



Time: 3 Hrs.

Max. Marks: 100

Answer any one question from each unit

All questions carry equal marks

M CO KL

## Section-A

1	a.	What is meant by plume and slag eye?	2	01	01
	b.	What is the source of Oxygen in steel? What is meant by killed steel?	2	01	01
	c.	Define Sieverts law and mention the application of this law in secondary steel making operation.	2	01	01
	d.	What is the criteria for Desulphurization in secondary steel making?	2	03	01
	e.	What is meant by Carryover slag? Differentiate between micro inclusion and macro inclusion.	2	01	01
	f.	What is meant by circulation number? What is meant by Ladle recycling	2	01	01
	g.	Why we should do ladle preheating? What is the preheating temperature?	2	01	01
	h.	What are the objectives of Secondary Steel Making? What is meant by Electrode Hunting?	2	01	01
	i.	Define the term Mixing Time. In a 200 tonne heat, calculate the mixing time, if the Argon gas is injected at the rate of $0.2 \text{ Nm}^3/\text{min}$ . Assuming that $D \approx H$ .	2	03	01
	j.	What is meant by free board? What is the purpose of sub lance?	2	01	01

## Section-B:

## Unit-I

2	a.	What are the conditions for Si and P removal in primary steel making? Define the terms: (i) Sopping (ii) Dry slag (iii) Blow (iv) Steel	8	02	01
	b.	Explain about (i) Slag Splashing Technique and (ii) Post Combustion Process	8	02	02

OR

3	a.	In BOF steel making, 5 metric ton of lime containing 90 wt% CaO is used to refine 100 metric ton of hot metal containing 93.2 wt% Fe. The slag produced during refining contains 40 wt% CaO and 22 wt% FeO. Neglecting material losses, the yield of Fe (in %) is?	8	02	03
	b.	In primary steelmaking, dissolved oxygen (O) reacts with carbon (C) to produce CO (g), at 1atm pressure according to the reaction $C+O = CO(g)$ . The equilibrium constant for this reaction is $\log K = (1160/T) + 2.003$ , where T is in Kelvin. Assuming Henrian activity coefficient of both O & C to be unity, the dissolved oxygen content (in wt%) of a plain carbon steel melt with 0.7 wt% C at 1600 °C is?	8	02	03

## Unit-II

4	a.	What are the parts of EAF? Mention what kind of refractory bricks used in	8	02	01
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		EAF at various parts. What are the various raw materials used in EAF? When Single and Double slag practice is done in EAF?			
	b.	What are the various methods of electrode consumption in EAF? Explain about Foamy Slag practice. Explain why icebergs are formed in the EAF and how can we overcome this.	8	02	01
<b>OR</b>					
5	a.	Explain the working principle of Induction furnace. Mention the raw material used in IF. Mention the advantages & limitations of IF steel making process.	8	02	02
	b.	Explain about CONARC process of Steel Making	8	02	02
<b>Unit-III</b>					
6	a.	What is meant by simple and complex deoxidation? give examples and mention the deoxidation kinetic steps. Why deoxidation is done before desulphurization?	8	03	01
	b.	Explain of Principle of Deoxidation with example. What are the various purposes of Ar gas purging in secondary steel making process?	8	03	02
<b>OR</b>					
7	a.	Calculate the theoretical amount of pure aluminum required to deoxidize 100 tons of steel at 1600°C, if oxygen has to be reduced from the initial value of 0.03 to 0.001wt%. Also what is the deoxidation constant? Given: $2[Al] + 3[O] = Al_2O_3$ ; $\log K' = (-58473/T) + 17.74$	8	03	03
	b.	(i) Deoxidation of liquid steel with Fe-Si produces spherical SiO <sub>2</sub> particles. The particles of 5µm dia take 3000 min to float up through a 2m height of liquid steel. For particles of 50 µm diameter to float through the same height, the time required in minutes is? (ii) Calculate the rising velocity of a 1.5µm dia slag particle, rising through stagnant liquid steel at 1873 K, given density of deoxidation product is 3000 kg/m <sup>3</sup> , & density of steel is 7600 kg/m <sup>3</sup> and viscosity is 7cp. ( $g = 9.81 m/s^2$ ).	8	03	03
<b>Unit-IV</b>					
8	a.	Define the terms (i) Clean Steel (ii) Sulphur Partition Ratio (iii) SEN (iv) Inclusion Engineering	8	01	01
	b.	Why desulphurization is done for steel? Explain about desulphurization process by Transitory & Permanent reaction. Why Ar purging is done to the shroud?	8	03	01
<b>OR</b>					
9	a.	1 ton of liquid steel initially containing 0.08% S is brought into equilibrium with 0.1 ton of slag containing no sulphur. If the S distribution ratio $L_s = (\%S)/[\%S] = 30$ , at equilibrium then the final sulphur content of steel in Wt% is?	8	03	03
	b.	Explain any TWO direct and indirect methods to evaluate steel cleanliness.	8	03	02
<b>UNIT-V</b>					
10	a.	Derive Sieverts law equation based on degassing equation $2 [G] = \{G_2\}$ . Explain about RH degassing process with neat sketch.	8		



	b.	What is meant by pressurizing and holding period in degassing process. Explain about tank degassing process with neat sketch.	8	03	01
<b>OR</b>					
11	a.	(i) Solution of Nitrogen in liquid iron may be assumed to obey Sieverts law, nitrogen content of liquid iron at 1873 K in equilibrium with 1atm pressure of nitrogen is measured as 0.044 (mass %). What will be the equilibrium nitrogen content in liquid iron (mass %) if Nitrogen pressure is reduced to 0.25atm? (ii) what is the source of N <sub>2</sub> & H <sub>2</sub> in steel and mention its adverse effects on high solubility of steel? For what grades of steels we use tank degassing & RH degassing process? How much pressure is maintained during degassing process?	8	03	03
	b.	In a RH degasser, the hydrogen mass balance is governed by the following equation: $-w \frac{dc_H}{dt} = R (C_H - C_{H,eq})$ where, w is the capacity of the degasser in ton C <sub>H</sub> is the hydrogen concentration at any time t & C <sub>H,eq</sub> is the equilibrium concentration of liquid steel. R is the circulation rate in ton/min. In order to bring down the hydrogen content from 5 ppm to 1 ppm in 20min, the circulation rate should be ----- (given C <sub>H,eq</sub> = 0.5 ppm, w = 150 ton).	8	03	03

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<b>Course Code: SOE-B-MME503</b>					
<b>O P JINDAL UNIVERSITY</b>					
<b>B. Tech. V Semester Regular Examinations</b>					
<b>Non-Ferrous Extractive Metallurgy</b>					
<b>Metallurgical Engineering</b>					
<b>Time: 3 Hrs.</b>		<b>Max. Marks: 100</b>			
Answer any one question from each unit					
All questions carry equal marks					
		<b>M</b>	<b>CO</b>	<b>KL</b>	
<b>Section-A</b>					
1	a.	Enlist the main functions of unit operations for metal extraction.	2	1	1
	b.	Why the ALCOA process consumes less energy than the Hall-Heroult process?	2	2	1
	c.	What type of reactions are involved in roasting operations?	2	2	1
	d.	Why matte smelting is a thermal concentrating process for sulphide ore?	2	2	1
	e.	Write the advantages of electrometallurgy process.	2	2	1
	f.	Why the carbothermic reduction of aluminium oxide is not commercially adopted method?	2	3	1
	g.	Construct a flow sheet for leaching of low grade of copper ore.	2	2	6
	h.	What are the functions of scrap iron in blast furnace smelting of lead ore?	2	3	1
	i.	Discuss the carbonyl process for non-ferrous metal.	2	2	6
	j.	Which sintering machine reduces the sulphur content of concentrate and how?	2	1	1
<b>Section-B:</b>					
<b>Unit-I</b>					
2	a.	Write the different applications of chromium and silicon metals based on their properties.	6	3	1
	b.	Classify the different laws of comminution to determine the efficiency of power utilization in crushing and grinding process.	5	2	4
	c.	Discuss the principle of jigging operation with well labelled diagram.	5	1	6
<b>OR</b>					
3	a.	Explain the importance of two noble metals based on their applications.	6	3	5
	b.	Elaborate the magnetic separation method using well labelled diagram.	5	1	6
	c.	How the ore beneficiation process affects the extraction of non-ferrous metals?	5	1	1
<b>Unit-II</b>					
4	a.	How the roasting and reduction methods affects the processing of sulphide ores? What kind of equipment's are normally used for roasting operation?	6	2	1
	b.	What are the steps involved in electrowinning of metals from aqueous solution? Explain with the help of one example.	5	2	1
	c.	Find the amount of coulomb required to deposit 34.2 gm of Ni containing	5	1	1



		nickel sulphate solution during electrometallurgical operation.			
<b>OR</b>					
5	a.	How the metallic values are recovered from leach liquor? Discuss by giving example.	6	2	1
	b.	What are the basic steps of hydrometallurgical process utilized for production of zinc in India.	5	2	1
	c.	Find the time required to deposit the 10 gm of Cu from $\text{CuSO}_4$ solution by maintaining 200 ampere of current in the solution.	5	1	1
<b>Unit-III</b>					
6	a.	Explain the reverberatory furnace smelting process of tin concentrate.	8	2	5
	b.	Why ferrosilicon is used as reducing agent in magnesium extraction? Explain the process in brief.	8	3	1
<b>OR</b>					
7	a.	Enlist the factors affecting the efficiency of Bayer's process.	8	2	1
	b.	Discuss the process for the recovery of more than 85% of tin.	8	2	6
<b>Unit-IV</b>					
8	a.	Discuss the Imperial Smelting Process (ISP) for zinc production with necessary sketch. List the advantages of ISP over other process.	8	2	6
	b.	Explain the treatment of lead ore in Dwight Lloyd sintering machine.	8	1	5
<b>OR</b>					
9	a.	How the pentlandite is treated using INCO process? Explain in detail.	8	2	1
	b.	Explain the Mitsubishi process with neat diagram for extraction of copper.	8	2	5
<b>Unit-V</b>					
10	a.	Explain the electrolytic refining method for achieving 99.99 % pure aluminium.	8	1	5
	b.	Discuss the process for recovery of silver from base metal ore.	8	2	6
<b>OR</b>					
11	a.	Construct a flow sheet for the extraction of platinum from platinum metal concentrate.	8	1	6
	b.	How copper can be recovered from industrial scrap?	8	3	1



Course Code: SOE-B-MME504

O P JINDAL UNIVERSITY

B. Tech. V Semester Regular Examinations

Phase Transformation

Metallurgical Engineering



Time: 3 Hrs.

Max. Marks: 100

Answer any one question from each unit

All questions carry equal marks

M	CO	K
		L

## Section-A

1	a.	Draw a Ni-Cu phase diagram (schematic), the melting point of Ni= 1455°C and melting point of Cu= 1082 °C. Draw temperature–time continuous cooling curve corresponding to Ni-50%Cu alloy from liquid alloy to solid at room temperature. Also, mark the region for the total solidification time in the continuous cooling curve?	2	CO1	1
	b.	What is the value of PV for a condensed phase? Define the term undercooling using the term melting point and nucleation of a solid phase.	2	CO2	3
	c.	What is the physical significance of the Clausius-Clapeyron Equation? For negative volume change ( $\Delta V$ is -ve), how it will affect the undercooling?	2	CO1	2
	d.	What is the 1-2-1 rule in the Cu-Ni phase diagram, explain using the Cu-Ni phase diagram. What do you mean by reduced phase rule (or) condensed Phase Rule?	2	CO1	2
	e.	In _____ the probability of nucleation of the solid phase is the same everywhere in the liquid phase. In _____, the solid phase is formed on preferred sites/on a substrate in the liquid phase.	2	CO2	1
	f.	Why interstitial diffusion is generally faster than substitutional diffusion. What is pipe diffusion? What is Kirkendall shift, explain with diagram	2	CO2	2
	g.	What is the difference between athermal and isothermal transformation? What do you mean by low atomic mobility in diffusion less growth?	2	CO2	3
	h.	What do you mean by positive and negative deviation from Raoult's law?	2	CO1	2
	i.	How coherent interface is different from a semi-coherent interface?	2	CO2	2
	j.	Draw the Stability map (Temperature Gradient versus Growth rate) and level the regions for planar, cellular and dendritic structures.	2	CO3	3
<b>Section-B:</b>					
<b>Unit-I</b>					
2	a.	What is the driving force for the solidification of pure Al at Its maximum undercooling (approximately 0.18 of its equilibrium melting temperature (Melting Point of Al 660 °C)? $\Delta H = -2579$ Cal/mole		CO2	2
	b.	With the help of temperature – composition diagram describe thermal undercooling and constitutional undercooling?		CO2	3
<b>OR</b>					
3	a.	Find the degree of freedom of mild steel (Fe-C system) at 1 atmospheric pressure. What does a phase diagram tell us (write at least three things)? Derive an equation ( $\Delta G = \Delta H \Delta T/T_m$ ) with a neat diagram for the driving force for solidification ( $\Delta G$ )		CO3	2



		$\Delta H$ is the heat content of the system, $\Delta T$ is the undercooling, and $T_m$ is the melting point.								
	b.	Calculate the change in the equilibrium melting point of Aluminium caused by a change of pressure of 8 kbar. The molar volume of Al is $6.0 \times 10^{-6} \text{ m}^3$ for the liquid and $5.46 \times 10^{-6} \text{ m}^3$ for the solid phase. The latent heat of the fusion of Al is 10.00 kJ/mol. The melting point of Al is 660 °C.	CO2	3						
<b>Unit-II</b>										
4	a.	Find the critical dimension of a nucleus of square shape during liquid-to-solid transformation considering homogeneous nucleation. Also, find the dimension of the square nucleus at total free energy ( $\Delta G$ ) = 0	CO3	3						
	b.	$\Delta G_{\text{het}} = \Delta G_{\text{hom}} S(\Theta)$ , where $S(\Theta)$ = Shape Factor, Write the physical significance of shape factor. Find the value of shape factor for $\Theta = 90^\circ$	CO3	2						
<b>OR</b>										
5	a.	Calculate the critical radius of the homogeneous nucleus from pure liquid Cu. Assume: $\Delta T = 0.2 T_m$ , $\gamma_{sl} = 0.177 \times 10^{-4} \text{ J/cm}^2$ , $T_m = 1083 \text{ C}$ , $\Delta H = 1826 \text{ J/cm}^3$ (ii) Calculate the number of atoms in the critical - sized nucleus at this undercooling	CO2	2						
	b.	How critical nucleus size ( $r^*$ ) and critical free energy for homogeneous nucleation ( $\Delta G^*$ ) vary with undercooling ( $\Delta T$ ), describe with the help of a schematic diagram.	CO3	2						
<b>Unit-III</b>										
6	a.	The pre-exponential and activation energy for the diffusion of iron in cobalt are $1.1 \times 10^{-5} \text{ m}^2/\text{s}$ and 253,300 J/mol, respectively. At what temperature will the diffusion coefficient have a value of $2.1 \times 10^{-14} \text{ m}^2/\text{s}$ ?	CO3	3						
	b.	What are Fick's first and second laws of diffusion? Why is it that at high temperatures most diffusional flux is through the lattice rather than the grain boundaries?	CO1	1						
<b>OR</b>										
7	a.	The diffusion coefficients for silver in copper are given at two temperatures: <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <thead> <tr> <th><math>T(^{\circ}\text{C})</math></th> <th><math>D (\text{m}^2/\text{s})</math></th> </tr> </thead> <tbody> <tr> <td>650</td> <td><math>5.5 \times 10^{-16}</math></td> </tr> <tr> <td>900</td> <td><math>1.3 \times 10^{-13}</math></td> </tr> </tbody> </table>	$T(^{\circ}\text{C})$	$D (\text{m}^2/\text{s})$	650	$5.5 \times 10^{-16}$	900	$1.3 \times 10^{-13}$	CO3	2
$T(^{\circ}\text{C})$	$D (\text{m}^2/\text{s})$									
650	$5.5 \times 10^{-16}$									
900	$1.3 \times 10^{-13}$									
	b.	(a) Determine the values of $D_0$ and $Q_d$ . (b) What is the magnitude of $D$ at 875°C? Explain Kirkendall's effects. What is the Matano interface? Why is interstitial atom diffusion so much easier than substitutional atom diffusion?	CO2	1						
<b>Unit-IV</b>										
8	a.	Some transformation having kinetics that obey the Avrami equation the parameter $n$ is known to have a value of 1.6. If, after 90 s, the reaction is 50% complete, how long (total time) will it take the transformation to go to 99% completion?	CO2	2						
	b.	Draw schematically a TTT diagram for austenite to pearlite transformation and superimpose CCT diagram on TTT diagram and show the formation of martensite, martensite + Pearlite and only Pearlite.	CO3	2						
<b>OR</b>										
9	a.	What do you understand by martensitic transformation? What are the characteristic of martensite? What do mean by Habit plane? Show a habit plane in austenite deformed structure. crystal structure	CO1	2						



	b.	Draw temperature-rate and temperature – time diagrams. Define kinetics of transformation. Describe Avrami equation, what exactly the it describes? Does the Avrami equation explains nucleation behavior also?	CO2	3
<b>UNIT-V</b>				
10	a.	In the case of coherency, which plane of $\alpha$ - Aluminium is parallel with $\theta'$ phase in Al-4.5% Cu alloy. Show with a schematic diagram the surface energy plot. What is the ratio of bond energy and structure energy if the radius of plate shaped precipitate is same as the thickness?	CO3	2
	b.	In semi-coherent precipitate, what will be the distance between neighbouring dislocation if the lattice parameter of B phase is 2 A and misfit parameter is 0.06 A	CO3	3
<b>OR</b>				
11	a.	Draw the hardness vs time plot at a temperature a 178 <sup>0</sup> C of ageing behavior of Al-4.5 % Cu precipitation hardened alloy and show the various precipitation sequence and also coherent and semi-coherent precipitates.	CO2	2
	b.	Find the misfit strain in percentage between two phases if the lattice parameters of phase 1 and phase 2 are 0.359 $\mu\text{m}$ and 0.352 $\mu\text{m}$ .	CO3	2

END

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Course Code: MEE 4236 (1)

**O P JINDAL UNIVERSITY**

**B. Tech. VIII Mechanical Semester- Backlog Examinations**

**Industrial Engineering and Production Management**



**Time: 3 Hrs.**

**Max. Marks: 100**

Answer any one question from each unit

All questions carry equal marks

**M CO KL**

**Section-A**

1	a.	Define industrial engineering? What is its importance?	2	1	1
	b.	Define plant layout.	2	1	1
	c.	What is productivity and what is its relationship with production?	2	2	2
	d.	Define work study	2	2	1
	e.	What is memo motion study?	2	2	2
	f.	Define time study and explain its objectives.	2	3	1
	g.	What is job evaluation?	2	3	2
	h.	Define ergonomics	2	4	1
	i.	What are the objectives of Production Management.	2	5	1
	j.	What is material requirement planning (MRP)	2	5	1

**Section-B:**

**Unit-I**

2	a.	What are the phase involved in system methodology? Explain it.	8	1	3
	b.	Explain why plant location decisions are important to the Organization.	8	1	2

**OR**

3	a.	Define plant layout. What are the objectives of good plant layout? Explain it with suitable examples	8	1	3
	b.	Compare product layout and process layout in detail.	8	1	2

**Unit-II**

4	a.	What are the various types of layout? Explain the application of each.	8	2	2
	b.	Explain the principle techniques of work measurement and their application.	8	2	3

**OR**

5	a.	Explain the various Industrial Engineering tools and techniques to improve productivity.	8	2	3
	b.	Define work study. What are the components of work study?	8	2	2



**Unit-III**

6	a.	Describe various methods of job evaluation giving their advantages and limitations.	8	3	3
	b.	Explain the factors that influence payment of wages to the employees.	8	3	3
<b>OR</b>					
7	a.	Explain the steps involved in point rating method of job evaluation.	8	3	2
	b.	What is merit rating and how it helps the industries?	8	3	3
<b>Unit-IV</b>					
8	a.	What is system? Explain man-machine system. Explain it.	8	4	2
	b.	Compare Job Production, Batch Production, Continuous Production and Cellular Production.	8	4	3
<b>OR</b>					
9	a.	What are the various functions of Production Department? Explain it with suitable examples.	8	4	3
	b.	Discuss in detail various costs associated with inventory.	8	4	2
<b>UNIT-V</b>					
10	a.	What is capacity requirement planning (CRP)? Explain it	8	5	3
	b.	What is long term and short term capacity planning. Explain it with suitable examples	8	5	2
<b>OR</b>					
11	a.	What is PERT and CPM ? Explain it with suitable examples	8	5	3
	b.	What is supply chain management? Explain it with suitable examples	8	5	2



Course Code: MEE 4236 (1)

**O P JINDAL UNIVERSITY****B. Tech. VIII Mechanical Semester- Backlog Examinations****Industrial Engineering and Production Management****Time: 3 Hrs.****Max. Marks: 100**

Answer any one question from each unit

All questions carry equal marks

**M CO KL****Section-A**

1	a.	Define industrial engineering? What is its importance?	2	1	1
	b.	Define plant layout.	2	1	1
	c.	What is productivity and what is its relationship with production?	2	2	2
	d.	Define work study	2	2	1
	e.	What is memo motion study?	2	2	2
	f.	Define time study and explain its objectives.	2	3	1
	g.	What is job evaluation?	2	3	2
	h.	Define ergonomics	2	4	1
	i.	What are the objectives of Production Management.	2	5	1
	j.	What is material requirement planning (MRP)	2	5	1

**Section-B:****Unit-I**

2	a.	What are the phase involved in system methodology? Explain it.	8	1	3
	b.	Explain why plant location decisions are important to the Organization.	8	1	2

**OR**

3	a.	Define plant layout. What are the objectives of good plant layout? Explain it with suitable examples	8	1	3
	b.	Compare product layout and process layout in detail.	8	1	2

**Unit-II**

4	a.	What are the various types of layout? Explain the application of each.	8	2	2
	b.	Explain the principle techniques of work measurement and their application.	8	2	3

**OR**

5	a.	Explain the various Industrial Engineering tools and techniques to improve productivity.	8	2	3
	b.	Define work study. What are the components of work study?	8	2	2



**Unit-III**

6	a.	Describe various methods of job evaluation giving their advantages and limitations.	8	3	3
	b.	Explain the factors that influence payment of wages to the employees.	8	3	3

**OR**

7	a.	Explain the steps involved in point rating method of job evaluation.	8	3	2
	b.	What is merit rating and how it helps the industries?	8	3	3

**Unit-IV**

8	a.	What is system? Explain man-machine system. Explain it.	8	4	2
	b.	Compare Job Production, Batch Production, Continuous Production and Cellular Production.	8	4	3

**OR**

9	a.	What are the various functions of Production Department? Explain it with suitable examples.	8	4	3
	b.	Discuss in detail various costs associated with inventory.	8	4	2

**UNIT-V**

10	a.	What is capacity requirement planning (CRP)? Explain it	8	5	3
	b.	What is long term and short term capacity planning. Explain it with suitable examples	8	5	2

**OR**

11	a.	What is PERT and CPM ? Explain it with suitable examples	8	5	3
	b.	What is supply chain management? Explain it with suitable examples	8	5	2



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Course Code: SOE-B-MME508					
O P JINDAL UNIVERSITY					
B. Tech. III Semester Regular Examinations					
Data Science for Engineers					
Department of Metallurgy, School of Engineering					
Time: 2 Hrs.			Max. Marks: 50		
Answer any one question from each unit					
All questions carry equal marks					
			M	CO: C508	KL
<b>Unit-I ( 10 marks)</b>					
1	a.	Compare data analytics and data science?	5	2	2
	b.	Explain advantage of R-programming language over other languages?	5	3	5
<b>OR</b>					
2	a.	Explain advantages of sampling?	5	2	2
	b.	Describe data mining?	5	4	6
<b>Unit-II</b>					
3	a.	Explain Overfitting of a prediction model and its demerits.	5	4	5
	b.	Explain Underfitting of a prediction model and its demerits.	5	4	5
<b>OR</b>					
4	a.	Compare Eigenvectors and Eigenvalues?	5	2	4
	b.	Describe importance of p-values, when it is high and low?	5	2	3
<b>Unit-III</b>					
5	a.	Explain Linear Regression?	5	5	2
	b.	Describe working of Random Forest algorithm?	5	6	6
<b>OR</b>					
6	a.	What are the limitations of linear regression?	5	6	1
	b.	Compare Data Science and Machine Learning and list differences?	5	2	5
<b>Unit-IV</b>					
7	a.	List 5 libraries in Python used for Data Analysis.	5	3	4
	b.	List 5 libraries in R used for Data Analysis	5	3	4
<b>OR</b>					
8	a.	Describe the importance of Microsoft Excel in data analytics?	5	1	6
	b.	Explain Ensemble Learning?	5	6	5
<b>UNIT-V</b>					
9	a.	List steps of formulation of a Data analytics project?	5	6	4
	b.	Explain working of artificial neural network?	5	5	2
<b>OR</b>					
10	a.	Explain K-means clustering method?	5	6	2
	b.	List 5 Deep Learning Frameworks?	5	3	4







Program Code: 01UG050		Course Code: SOE-B-MME510			
<b>O P JINDAL UNIVERSITY</b>					
<b>III B.Tech. V Semester Regular Examinations</b>					
<b>DESIGN THINKING (ONLINE)</b>					
(Offered to Dept. of Metallurgical Engineering)					
Time: 2 Hrs.		Max. Marks: 50			
Answer any one question from each unit					
All questions carry equal marks					
		M	CO	KL	
<b>Unit-I ( 10 marks)</b>					
1	a.	What is design thinking? What are the different stages in Design Thinking? What feature distinguishes design thinking from other approaches?	5	1	1,2
	b.	What does empathy stage consist of? Explain.	5	1	1
<b>OR</b>					
2	a.	Briefly describe any product of your choice where design thinking approach was implemented.	5	2	5
	b.	What is empathy and why is it so important in design thinking?	5	3	1,2
<b>Unit-II</b>					
3	a.	You have received a set of data and been asked to analyze data trends. How will you proceed?	5	4	5
	b.	Write down the features a tea cup should have applying design thinking.	5	4	3
<b>OR</b>					
4	a.	What are the questions one need to ask themselves before acting upon data to analyze trends?	5	1	1
	b.	Write down the various problems one faces while making a roti. What could be the most important problem according to you?	5	4	4
<b>Unit-III</b>					
5	a.	How can you make sure that volume of ideas is generated in the Ideation stage?	5	1	1
	b.	People often forget to take medicines. Write down some ideas to solve this problem.	5	4	6
<b>OR</b>					
6	a.	List the steps one can go through in the Ideation/brainstorming exercise.	5	1	1
	b.	Generate ideas to create a compact low cost light weight utensil to serve airline food.	5	2	6
<b>Unit-IV</b>					
7	a.	What is meant by the term 'Fail fast'? Explain.	5	1	2
	b.	Explain why is prototyping so powerful?	5	1	2
<b>OR</b>					
8	a.	What does prototype stage constitute of in the design thinking process? Discuss.	5	1	1
	b.	Describe the method of paper prototyping.	5	1	1



**UNIT-V**

9	a.	You have <i>completed</i> the prototype stage and have to proceed now to testing stage. How will you ensure that this stage is successful? Explain briefly.	5	5	2
	b.	Comment on the non-linearity of the design thinking process.	5	3	2
<b>OR</b>					
10	a.	What is most important for the success of the testing phase of design thinking? Explain briefly.	5	3	2
	b.	Describe briefly how the testing phase can be carried out.	5	5	2