Subject Code: SOE-M-PPE101

OP JINDAL UNIVERSITY, RAIGARH

BACKLOG END SEMESTER EXAMINATION, JUNE-2023

M.Tech. 1st Semester

Department of Mechanical Engineering [01PG041]

Advanced Computational Methods and Optimization Techniques

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

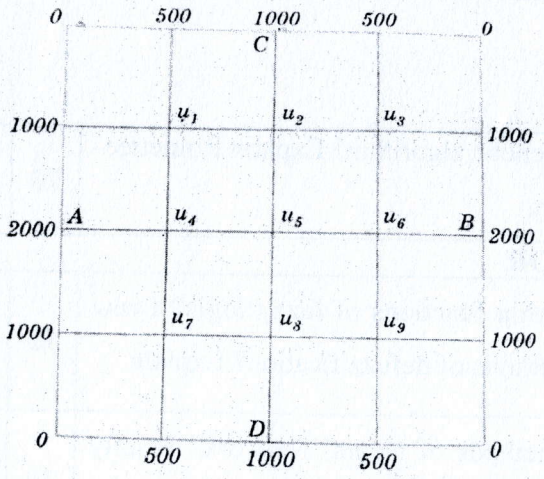
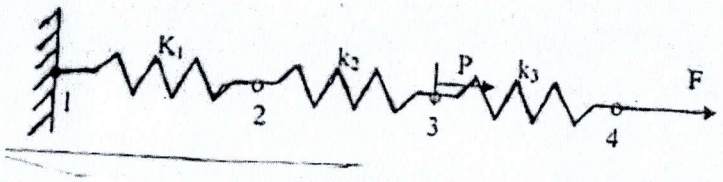
Answer any one question from each unit.

All questions carry equal marks.

			M	CO	KL
Unit-I (20 marks)					
1	a.	Solve the following equations using Gauss Elimination Method. $x+4y-z=-5$ $x+y-6z=-12$ $3x-y-z=4$	10	1	3
	b.	Find the real roots of equation $3x=\cos x+1$ using Newton Raphson Method correct to three decimal places.	10	1	2
OR					
2	a.	Solve the following equations using Gauss-Seidel method. $27x+6y-z=85$ $x+y+54z=110$ $6x+15y+2z=72$	10	1	3
	b.	Find the root of equation $x^3-2x-5=0$ using Secant Method correct to three decimal places.	10	1	2
Unit-II					
3	a.	The table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface: (Use Newton's Forward). Find the value of 'y' when 'x' = 160	10	2	3

x = height:	100	150	200	250	300	350	400	
y = distance:	10.63	13.03	15.04	16.81	18.42	19.90	21.27	

	b.	Find the polynomial $f(x)$ by using Lagrange's formula and hence find $f(3)$ for $x =$ 0 1 2 5 $f(x)$ 2 3 12 147	10	2	2
		OR			
4	a.	Determine $f(x)$ as a polynomial in x for the following using Newton's divided difference formula for the given values. $x =$ -4 -1 0 2 5 $y = f(x)$ 1245 33 5 9 1335	10	2	2
	b.	Find the missing term in the following table using Langrange's Interpolation $x =$ 0 1 2 3 4 y 1 3 9 ------- 81	10	2	2
		Unit-III			
5	a.	Solve $y' = x + y,\ y(0) = 1$ by Taylor's series method. Hence find the values of y at $x = 0.1$ and $x = 0.2$.	10	3	2
	b.	Given $\frac{dy}{dx} = \frac{y-x}{y+x}$ with initial condition $y = 1$ at $x = 0$; find y for $x = 0.1$ by Euler's Method.	10	3	3
		OR			
6	a.	Using Euler's method, find an approximation value of $'y'$ corresponding to $x = 1$, given that $dy/dx = x + y$ and $y = 1$ when $x = 0$.	10	3	3
	b.	Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown in the figure.	10	3	3

					
Unit-IV					
7	a.	In the given spring structure, k1 = 20 lb/in, k2 = 25 lb/in, K3 = 30 ib/in, F = 5 lb. Determine deflection at all the nodes. 	10	4	3
	b.	Solve by Taylor series method of third order the equation $\frac{dy}{dx} = \frac{x^3+xy^2}{e^x}, y(0) = 1$ for $'y'$ at $x = 0.1, x = 0.2, x = 0.3$.	10	4	2
OR					
8	a.	Define Finite element? Write the importance of FEA (finite element analysis). List out the various steps involved in FEA.	10	4	1
	b.	Find the real root of equation $3x = \cos x + 1$ up to three decimal places using N-R-Method.	10	4	2
UNIT-V					
9	a.	Describe ADALINE (Adaptive Linear Neural Network) and MADALINE (multiple Adaptive Linear Neural Network). Write the application of Neural Network.	10	5	2

	b.	What are different selection operator in Genetic algorithm? Explain Roulettee-wheel selection and Tournament selection.	10	5	1
		OR			
10	a.	What are the different types of membership functions of fuzzy logic? Draw each functions. What are the different methods of defuzzification? Explain.	10	5	1
	b.	What are the different types learning methods of Neural Network? Briefly describe. What are the different types of Neural Network? Discuss their types.	10	5	2

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Course Code: SOE-M-PPE102

OP JINDAL UNIVERSITY, RAIGARH

END SEMESTER EXAMINATION, JUNE-2023

M.Tech. 1st Semester

Mechanical Engineering (PPEEM) [01UG041]

Advanced Power Plant Engineering

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

Answer any one question from each unit

All questions carry equal marks

Students are allowed to use the Steam tables

			M	CO	KL
Unit-I (20 Marks)					
1	a.	Explain the modern steam power plant with its 4 major circuits and layout.	10	1	2
	b.	What are the various factors need to be considered for site selection of thermal power plant?	10	1	3
OR					
2	a.	Compare the conventional and non-conventional energy sources on various aspects.	10	1	2
	b.	Explain the coal to electricity conversion in thermal power plant in detail.	10	1	1
Unit-II (20 Marks)					
3	a.	What are the various factors need to be considered for site selection of hydroelectric plant?	10	2	2
	b.	Classify the prime movers on various aspects. Also, define the specific speed of turbine and cavitation in hydroelectric plant.	10	2	3
OR					
4	a.	Explain the hydroelectric power plant with the help of neat sketch showing all the important components.	10	2	3
	b.	Explain the current scenario and future trends of hydroelectric power plant in India.	10	2	3
Unit-III (20 Marks)					
5	a.	List the advantages and disadvantages of Diesel power plant.	10	3	2
	b.	Explain the nuclear power plant components and their function with plant diagram.	10	3	2
OR					
6	a.	Explain the combustion phenomenon in C.I. engine.	10	3	1
	b.	Explain the nuclear fission and nuclear fusion process with the help of one example.	10	3	3
Unit-IV (20 Marks)					
7	a.	Show the schematic diagram of open cycle Gas Turbine power plant and derive cycle efficiency formula.	10	4	2
	b.	A gas turbine unit receives air at 100 kPa and 300K and compresses it adiabatically to 620 kPa. The fuel has heating value of 44180 kJ /kg and fuel /air ratio is 0.017 kg fuel per kg air. The isentropic efficiencies of the compressor and the turbine are 88% and 90%, respectively. Calculate the compressor work, the turbine work, and the thermal efficiency.	10	4	2
OR					
8	a.	Explain the combined cycle power plant with schematic diagram. Also sketch the p-v	10	4	3

		and T-s diagram for combined cycle.			
	b.	List the advantages, disadvantages and limitations of gas turbine power plant.	10	4	2
UNIT-V (20 Marks)					
9	a.	List the names of various schemes of energy storage and provide brief explanation.	10	5	1
	b.	Explain the Electrochemical energy storage systems with comparison diagram of battery and fuel cell.	10	5	3
OR					
10	a.	Explain the pumped hydroelectric energy storage scheme with schematic diagram.	10	5	2
	b.	Explain the thermal energy storage system in detail.	10	5	2

Course Code: SOE-M-PPE103

O P JINDAL UNIVERSITY

End Semester Examinations

M. Tech. 1st Semester

Power Plant Engineering & Energy Management

Mechanical Engineering

SOE-M-PPE103-Power Plant Machines

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

Answer any one question from each unit

All questions in each unit carry equal marks

			M	CO	KL
Unit-I (20 marks)					
1	a.	What is the function of synchronous condenser?	10	1	II
	b.	The EMFs of two alternators are 0 3000∠20 V and 0 2900∠0 V. Their synchronous impedances are (2 + j20) Ω/phase and (2.5 + j30) Ω/phase. The load impedance is (10 + j4) Ω/phase. Find the circulating current.	10	1	III
OR					
2	a.	How hunting can be suppressed	8	3	II
	b.	A 660V, 3-phase star-connected synchronous motor draws 50 kW at a power factor of 0.8 lagging. Calculate new current and power factor when the back e.m.f increases by 50%. The machine has synchronous reactance of 3 ohm and effective resistance is negligible.	12	2	III
Unit-II					
3	a.	What is voltage regulation? Explain the synchronous impedance method for the determination of voltage regulation of an alternator.	10	2	II
	b.	Explain the construction of damper winding. Clearly show the location of damper winding.	10	4	VI
OR					
4	a.	Derive an expression for induced E.M.F per phase in a three phase alternator? Mention how different winding factors affect the induced emf?	10	3	II
	b.	A 4 pole, 3-phase, 50 Hz, star connected alternator has 60 slots with 4 conductors per slot. Coils are short pitched by 3 slots. If the phase spread is 600, find the line voltage induced for a flux per pole of 0.0943 Wb distributed sinusoidal in space. All the turns in phase are in series.	10	1	I
Unit-III					
5	a.	Explain the construction and operating principle of synchronous motor. Show the region of region of operation of the condenser on V-curves	10	3	II
	b.	Why single-phase induction motors are not self-starting? How it can be started.	10	2	I
OR					
6	a.	Describe double revolving field theory as applied to single phase induction motor.	10	2	II
	b.	Show that locus of power of a synchronous machine is circle? Give the co-ordinates of power circle.	10	4	II

Unit-IV					
7	a.	Explain the factors, which can change the system resistance?	6	3	VI
	b.	What are the fan performance and efficiency characteristics with respect to fan selection	14	3	V
OR					
8	a.	What are affinity laws as applicable to centrifugal fans?	10	3	V
	b.	Explain the method of flow measurements using pitot tube?	10	3	V
UNIT-V					
9	a.	Explain the terms static head and friction head?	4	4	I
	b.	What are the various methods of pump capacity control normally adopted in power plants?	16	3	V
OR					
10	a.	What is NPSH of a pump and what are the effects of inadequate NPSH?	8	4	V
	b.	State the affinity laws as applicable to centrifugal pumps?	12	3	V

Course Code: SOE-M-PPE104

OP JINDAL UNIVERSITY, RAIGARH

END SEMESTER EXAMINATION, JUNE-2023

M.Tech. 1st Semester

Mechanical Engineering [01PG041]

Advanced Thermodynamics & Combustion

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

Note:

Answer any one question from each unit

All questions carry equal marks

			M	CO	KL
Unit-I (20 marks)					
1	a.	A system maintained at constant volume is initially at temperature T_1, and a heat reservoir at the lower temperature T_0 is available. Show that the maximum work recoverable as the system is cooled to T_0 is $$W = C_v\left[(T_1 - T_0) - T_0 \ln\frac{T_1}{T_0}\right]$$	10	1	2
	b.	Two Carnot engines A and B are connected in series between two thermal reservoirs maintained at 1000 K and 100 K respectively. Engine A receives 1680 kJ of heat from the high temperature reservoir and rejects heat to the Carnot engine B. Engine B takes in heat rejected by engine A and rejects heat to the low-temperature reservoir. If engines A and B have equal thermal efficiencies, determine (i) The heat rejected by engine B. (ii) The temperature at which heat is rejected by engine, A. (iii) The work done during the process by engines, A and B respectively.	10	1	3
OR					
2	a.	What do you understand by the entropy principle? Show that the transfer of heat through a finite temperature difference is irreversible.	10	1	2
	b.	Ten grammes of water at 20°C is converted into ice at −10°C at constant atmospheric pressure. Assuming the specific heat of liquid water to remain constant at 4.2 J/g.K and that of ice to be half of this value, and taking the latent heat of fusion of ice at 0°C to be 335 J/g, calculate the total entropy change of the system.	10	1	3
Unit-II (20 marks)					
3	a.	Calculate the decrease in available energy when 25 kg of water at 95°C mix with 35 kg of water at 35°C, the pressure being taken as constant and the temperature of the surrounding being 15°C. For water, take cp = 4.2 kJ/kgK.	10	1	3
	b.	Construct the phase equilibrium diagram on p-v, T-s, and h-s coordinates for water with relevant constant property lines.	10	2	2
OR					
4	a.	Derive the expression for reversible work done (available energy/availability)	10	1	2

		by a closed system interacting only with the surrounding.			
	b.	A vessel of volume 0.04 m^3 contains a mixture of saturated water and saturated steam at a temperature of 250°C. The mass of the liquid present is 9 kg. Find the pressure, the mass, the specific volume, the enthalpy, the entropy and the internal energy.	10	2	3
Unit-III (20 marks)					
5	a.	(i) The specific heats of a gas are given by $c_p = a + kT$ and $c_v = b + kT$, where a, b, and K are constants and T is in K. Show that for an isentropic expansion of this gas $T^b v^{a-b} e^{kT} = Constant$ (ii) 1.5 kg of this gas is occupying a volume of 0.06 m^3 at 5.6 MPa expands isentropically until the temperature is 240°C. If a = 0.946, b = 0.662, and k = 10^{-4}, calculate the work done in the expansion.	10	3	3
	b.	Two vessels, A and B containing nitrogen, are connected by a valve which is opened to allow the contents to mix and achieve equilibrium temperature of 27°C. Before mixing the following information is known about the gases in the two vessels. Vessel A: p = 1.5 MPa, t = 50°C, contents = 0.5 kg mol Vessel B: p = 0.6 MPa, t = 20°C, contents = 2.5 kg mol Calculate the final equilibrium pressure, and the amount of heat transferred to the surroundings. If the vessel had been perfectly insulated, calculate the final temperature and pressure which would have been reached. Take $\gamma = 1.4$	10	3	3
OR					
6	a.	Write down the Van Der Walls equation of state. How does it differ from the ideal equation of state? Express the Van Der Walls constants in term of critical properties.	10	3	2
	b.	0.5 kg of air is compressed reversible and adiabatically from 80 kPa, 60°C, to 0.4 MPa, and is then expanded at constant pressure to the original volume. Sketch these processes on the p-v and T-s planes. Compute the heat transfer and work transfer for the whole path.	10	3	3
Unit-IV (20 marks)					
7	a.	What is the significance of Clasius Clapeyron Equation? Derive the same.	10	4	2
	b.	Derive the first and second T-dS equation and then derive the expression for the difference in heat capacities, Cp and Cv $c_p - c_v = \frac{Tv\beta^2}{K_T}$, where the notations have their usual meanings	10	4	2
OR					
8	a.	Show that the internal energy and enthalpy of an ideal are function of temperature only.	10	4	2
	b.	Explain Joule-Kelvin effect and prove that Joule-Thomson Coefficient	10	4	2

		$\mu_J = \left(\frac{\partial T}{\partial p}\right)_h = \frac{1}{C_p}\left[T\left(\frac{\partial v}{\partial T}\right)_p - v\right]$			
UNIT-V (20 marks)					
9	a.	At 35°C and 1 atm. the degree of dissociation of N_2O_4 at equilibrium is 0.27. (a) Calculate K. (b) Calculate ε_e at the same temperature when the pressure is 100 mm Hg. (c) The equilibrium constant for the dissociation of N_2O_4 has the values 0.664 and 0.141 at temperatures 318 and 298 K respectively. Calculate the average heat of reaction within this temperature range.	10	5	3
	b.	Derive the Nernst's equation. What does it signify?	10	5	2
OR					
10	a.	Starting with n_0 moles of NH_3, which dissociates according to the equation $$NH_3 \leftrightarrow \frac{1}{2} N_2 + \frac{3}{2} H_2$$ Show that at equilibrium, $$K = \frac{\sqrt{27}}{4} * \frac{\varepsilon_e^2}{1 - \varepsilon_e^2} * p$$	10	5	3
	b.	The products of combustion of an unknown hydrocarbon CxHy have the following composition as measured by an Orsat apparatus CO_2 - 8.0%, CO - 0.9%, O_2 - 8.8% and N_2 - 82.3%. Determine (i) the composition of the fuel, (ii) the air fuel ratio, and (iii) the percentage excess air used.	10	5	3

Course Code: SOE-M-PPE105(1)

O P JINDAL UNIVERSITY

END SEMESTER EXAMINATION (Backlog), July-2023
M. Tech. (PPEEM) 1st Semester
Mechanical Engineering
DESIGN & ANALYSIS OF THERMAL POWER PLANT EQUIPMENT's

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

Answer any one question from each unit
All questions carry equal marks, Use of Heat and Mass Transfer Data book is allowed in the exam hall

			M	CO	KL
		Section-A			
1	a.	What is the relevance of stagnation temperature and pressure in gas dynamics?	2	CO1	1
	b.	What is meant by Mach number?	2	CO1	1
	c.	Argon is stored in a reservoir at 323 K. Determine the stagnation enthalpy and velocity of sound in air. Mol wt of Argon= 39.94 and v=1.658	2	CO1	1
	d.	List the methods to calculate effectiveness of heat exchangers. .	2	CO5	1
	e.	What is stalling in turbomachinery? how can it be avoided?	2	CO4	1
	f.	Draw the velocity plot for axial flow air compressor	2	CO3	1
	g.	What do you mean by stalling in compressor	2	CO3	1
	h.	What do you mean by pre whirl.	2	CO3	1
	i.	What are air preheaters and economizers? what is their significance in a thermal power plant?	2	CO5	1
	j.	Name some specific applications of shell and tube heat exchangers.	2	CO2	1
		Section-B:			
		Unit-I			
2	a.	Air enters a compressor at a stagnation state of 100 kPa and 27 ◦C. If it has to be compressed to a stagnation pressure of 900 kPa, calculate the power input to the compressor when the mass flow rate is 0.02 kg s−1. Assume the compression process to be isentropic.	8	CO1	2
	b.	Discuss the shock waves generated during a supersonic flow.	8	CO1	3
		OR			
3	a.	Air enters a converging–diverging nozzle at 1.0 MPa and 800 K with a negligible velocity. The flow is steady, one-dimensional, and isentropic with k = 1.4. For an exit Mach number of M_a = 2 and a throat area of 20 cm², determine (a) pressure, temperature, density & velocity at the throat.	8	CO1	3
	b.	Discuss Buckingham's PI Theorem with its applications.	8	CO1	2
		Unit-II			
4	a.	Explain the factors affecting the energy conversion in combustion chambers?	8	CO3	2
	b.	Explain any two zones of the combustion chamber	8	CO3	3
		OR			
5	a.	Discuss the factors affecting design of combustors in a thermal power plant.	8	CO3	2
	b.	Explain in short, any two types of combustion chamber in detail.	8	CO3	3

		Unit-III			
6	a.	Discuss in detail about stalling in compressors and measures taken to avoid stalling.	8	CO2	2
	b.	Draw the velocity and pressure plot for a centrifugal and axial flow compressor.	8	CO2	3
		OR			
7	a.	For the given condition, design an axial flow compressor with the following parameters Stagnation enthalpy at inlet = 290K, stagnation pressure at inlet = 1.01 bar, Compressor pressure ratio= 4, mass flow rate =22 kg/s, Find speed of the compressor, relative Mach number at entry and hub radius.	8	CO2	3
	b.	With neat sketches, discuss in detail about the different centrifugal compressor impellers? Also discuss, backward and forward swept blades?	8	CO2	3
		Unit-IV			
8	a.	Explain the velocity triangle for axial flow turbine blades in Gas Turbine Plant	8	CO4	2
	b.	How is turbine blade protected from degradation due to extremely high temperatures? Discuss in detail.	8	CO4	2
		OR			
9	a.	For a given single stage turbine the following data are available Mass flow rate=21 kg/s, turbine efficiency = 92%, T_{o1}= 1150K, c_p=1.15 kJ/kg K, temperature drop=150 K, pressure ratio=1.873, inlet pressure=4 bar, ,N = 250 rps, U=340 m/s, Nozzle loss coefficient= 5%. Find the blade angles for the turbine.	8	CO4	3
	b.	Comment on degree of reaction and turbine matching for gas turbines.	8	CO4	2
		UNIT-V			
10	a.	A 2 shell pass and 4 tube pass heat exchanger is to be used to heat glycerin from 20°C TO 50 °C by hot water that enters the thin walled 2 cm diameter tubes at 80 °C and leaves at 40°C. The total length of the tubes in the heat exchanger is 60 m. The convection heat transfer coefficient is 25W/m^2 °C on the glycerin side (shell side) and 160 W/m^2 °C on the water (tube side). Determine the rate of heat transfer in the heat exchanger a)without fouling b) after fouling with a fouling factor of 0.0006 m2°C/W occurs at the outer surface of the tubes.	8	CO5	3
	b.	Discuss the criteria for selection of heat exchangers for any given process.	8	CO5	3
		OR			
11	a.	Design a suitable shell and tube heat exchanger under following conditions: Shell side fluid condition: Water, T_{ci}=40°C, m_c = 2.8 kg/s, T_{co} = 110°C Tube side flow: T_{hi}=310°C, T_{ho} = 150°C and m_h = 1.5 kg/s Obtain the following:LMTD & outside heat transfer coefficient	8	CO5	2
	b.	ii) obtain Inside heat transfer coefficient for part (a)	8	CO5	3

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Subject Code: SOE-M-MTA101

OP JINDAL UNIVERSITY, RAIGARH

BACKLOG END SEMESTER EXAMINATION, JUNE-2023

M.Tech. 1st Semester

Department of Mechanical Engineering [01PG042]

Computational Methods and Optimization

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

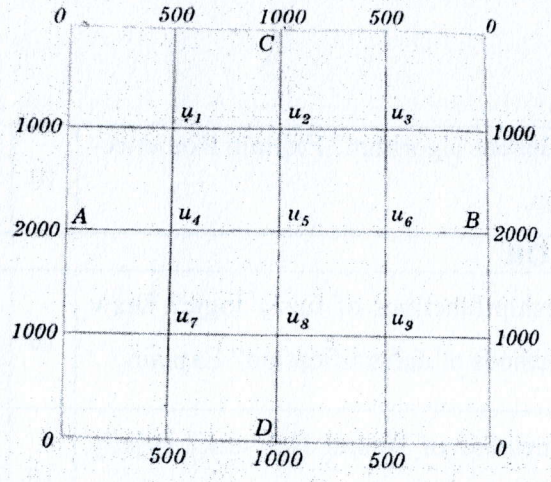
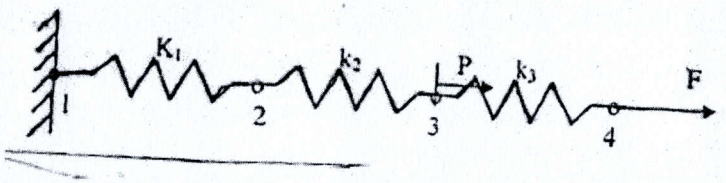
Answer any one question from each unit.

All questions carry equal marks.

			M	CO	KL
Unit-I (20 marks)					
1	a.	Solve the following equations using Gauss Elimination Method. $x+4y-z=-5$ $x+y-6z=-12$ $3x-y-z=4$	10	1	3
	b.	Find the real roots of equation $3x=\cos x+1$ using Newton Raphson Method correct to three decimal places.	10	1	2
OR					
2	a.	Solve the following equations using Gauss-Seidel method. $27x+6y-z=85$ $x+y+54z=110$ $6x+15y+2z=72$	10	1	3
	b.	Find the root of equation $x^3-2x-5=0$ using Secant Method correct to three decimal places.	10	1	2
Unit-II					
3	a.	The table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface: (Use Newton's Forward). Find the value of 'y' when $'x' = 160$	10	2	3

x = height:	100	150	200	250	300	350	400	
y = distance:	10.63	13.03	15.04	16.81	18.42	19.90	21.27	

	b.	Find the polynomial $f(x)$ by using Lagrange's formula and hence find $f(3)$ for $x =$ 0 1 2 5 $f(x)$ 2 3 12 147	10	2	2
		OR			
4	a.	Determine $f(x)$ as a polynomial in x for the following using Newton's divided difference formula for the given values. $x =$ -4 -1 0 2 5 $y = f(x)$ 1245 33 5 9 1335	10	2	2
	b.	Find the missing term in the following table using Langrange's Interpolation $x =$ 0 1 2 3 4 y 1 3 9 ------- 81	10	2	2
		Unit-III			
5	a.	Solve $y' = x + y,\ y(0) = 1$ by Taylor's series method. Hence find the values of y at $x = 0.1$ and $x = 0.2$.	10	3	2
	b.	Given $\frac{dy}{dx} = \frac{y-x}{y+x}$ with initial condition $y = 1$ at $x = 0$; find y for $x = 0.1$ by Euler's Method.	10	3	3
		OR			
6	a.	Using Euler's method, find an approximation value of $'y'$ corresponding to $x = 1$, given that $dy/dx = x + y$ and $y = 1$ when $x = 0$.	10	3	3
	b.	Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown in the figure.	10	3	3

					
Unit-IV					
7	a.	In the given spring structure, k1 = 20 lb/in, k2 = 25 lb/in, K3 = 30 ib/in, F = 5 lb. Determine deflection at all the nodes. 	10	4	3
	b.	Solve by Taylor series method of third order the equation $\frac{dy}{dx} = \frac{x^3+xy^2}{e^x}, y(0) =$ 1 for $'y'$ at $x = 0.1, x = 0.2, x = 0.3$.	10	4	2
OR					
8	a.	Define Finite element? Write the importance of FEA (finite element analysis). List out the various steps involved in FEA.	10	4	1
	b.	Find the real root of equation $3x = \cos x + 1$ up to three decimal places using N-R-Method.	10	4	2
UNIT-V					
9	a.	Describe ADALINE (Adaptive Linear Neural Network) and MADALINE (multiple Adaptive Linear Neural Network). Write the application of Neural Network.	10	5	2

	b.	What are different selection operator in Genetic algorithm? Explain Roulettee-wheel selection and Tournament selection.	10	5	1
		OR			
10	a.	What are the different types of membership functions of fuzzy logic? Draw each functions. What are the different methods of defuzzification? Explain.	10	5	1
	b.	What are the different types learning methods of Neural Network? Briefly describe. What are the different types of Neural Network? Discuss their types.	10	5	2

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Course Code: SOE-M-MTA102

OP JINDAL UNIVERSITY, RAIGARH

END SEMESTER EXAMINATION, JUNE-2023

M. Tech. 1st Semester

Mechanical Engineering [01PG042]

ADVANCED MANUFACTURING PROCESSES

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

Note:

Answer any one question from each unit

All questions carry equal marks

			M	CO	KL
Unit-I (20 marks)					
1	a.	What are the limitations of conventional machining processes? Estimate the MRR in Abrasive Jet Machining (AJM) of a brittle material with flow strength of 4 GPA. The abrasive flow rate is 2 gm/min, velocity is 200m/s, density of abrasive is 3 gm/sec.	10	1	3
	b.	In USM, describe the effect of abrasive grain size and applied static load on MRR. USM is used for drilling a hole (under the same machining conditions) in aluminum and cast iron. Which one will have higher depth of drilled hole? And why.	10	1	2
OR					
2	a.	What are the various types of energy on which the advanced machining processes are classified? Discuss the various non-conventional machining process with respect to their suitability to machine different materials.	10	1	3
	b.	Draw a schematic diagram of AJM system also explain the working principle of AJM process.	10	1	1
Unit-II (20 marks)					
3	a.	State the function of electrolyte used in ECM process? Also explain why there is theoretically zero tool wear in ECM process.	10	2	2
	b.	Describe the working principle and procedure of chemical machining.	10	2	1
OR					
4	a.	What do you understand by etch factor in chemical machining? Describe the effect of various parameters that influences the performance of chemical machining.	10	2	2
	b.	Explain the working principle involved in ECM process along with the electrochemistry of the process.	10	2	3

Unit-III (20 marks)					
5	a.	What do you understand by 'Plasma"? Explain in brief. can we machine electrically non-conductive materials by Plasma Arc Machining?	10	3	2
	b.	What is duty cycle in EDM Process? What is overcutting in EDM process and how is it affected by current and frequency?	10	3	2
OR					
6	a.	What are the various factors affecting metal removal rate in an EDM process, explain any three?	10	3	3
	b.	Describe the metal removal mechanism in electrical discharge machining.	10	3	2
Unit-IV (20 marks)					
7	a.	How a complex shape can be cut using EBM process? Write four specific applications where you feel that EBM should be the preferable choice.	10	4	3
	b.	How is the worktable protected from getting damaged by the laser beam? Explain the effect of 'focusing' on the performance of LBM.	10	4	2
OR					
8	a.	Explain the production of laser beam and working principle of LBM.	10	4	2
	b.	Explain the working principle of EBM process. Make the necessary sketch.	10	4	2
UNIT-V (20 marks)					
9	a.	Describe the process principle of high energy rate forming. Name various explosives used in high energy rate forming.	10	5	3
	b.	Explain the working principle of Electrochemical Discharge Machining (ECDM).	10	5	3
OR					
10	a.	What do you mean by hybrid machining processes? Classify the hybrid machining processes.	10	5	2
	b.	Discuss in detail about Explosive Forming and Electrohydraulic Forming process.	10	5	3

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Course Code: SOE-M-MTA103

O P JINDAL UNIVERSITY

M. Tech. I Semester Backlog Examinations

ADVANCED MATERIALS AND PROCESSING

(Offered to Mechanical Engineering / 01PG051)

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

Questions 1 and 6 are compulsory

For each question, wherever necessary, a separate diagram is to be drawn

			M	CO	KL
1		State TRUE or FALSE, Justify your answer.			
	a	Hydroxyapatite is $Ca_{10}(PO_4)_6OH_2$	2	1	1
	b	Fe-4.3C would be preferred for making two-wheeler engine heads	2	1	1
	c	Cementite contains 6.67%C in it	2	3	1
	d	The lever rule is used to identify the % content of different phases	2	2	1
	e	Jominy end quench test is used to identify the Hardnability of a steel	2	3	1
	f	Pb-Sn alloy is used for soldering purposes	2	1	1
	g	Duralumin contains Al, Cu, Mn, and Mg	2	4	1
	h	Brass is an alloy of copper and Zinc	2	3	1
	i	Duralumin is a lightweight metal alloy	2	1	1
	j	Recrystallization temperature is inversely proportional to the degree of cold work	2	2	1
2	a.	Apply the lever rule to identify (1) % of Liquid and Austenite (2) % of Austenite and Cementite. Assume the suitable fulcrum point as per your choice. (draw a separate diagram to show different levers and fulcrums).	8	3	2
	b.	Draw the strength and ductility trend from Recovery, Recrystallization, Grain Growth perspective and discuss it elaborately.	8	5	2
		OR			
2	c.	Apply the lever rule at two different positions on the Fe-Fe_3C diagram and show calculations for different phase identification. (draw a separate diagram to show different levers and fulcrums, assume the necessary information)	8	1	2
	d.	Explain the phenomenon of Recovery, Recrystallization, Grain Growth and discuss it elaborately.	8	6	2
3	a.	Discuss the effects on the mechanical behavior of metal from the perspective of Hardness, Toughness, Brittleness, and Ductility.	8	2	2
	b.	Describe the principle of an optical microscope and elaborate steps to prepare a metal sample for the same.	8	5	2
		OR			
3	c.	Mention any 4 mechanical properties of metals, and describe their effects on the metal behavior.	8	4	2

	d.	Describe the stepwise procedure for the microstructural examination of a raw metal piece.	8	3	2
4	a.	Describe Jominy End Quench Test and discuss it elaborately.	8	5	2
	b.	Discuss at what temperature would you heat a steel containing 1.5%C for the hardening process. (draw a suitable diagram to support your discussion)	8	2	2
		OR			
4	c.	Describe and elaborate a method to measure hardenability.	8	3	2
	d.	Elaborate in detail, with a proper diagram, the reason why hypereutectoid steels can be preferred to heat above the A1 line for the hardening process.	8	4	2
5	a.	Draw a CCT diagram and discuss it elaborately. Throw some light on the term CCR	8	5	3
	b.	Draw Hardening and Normalizing temperature ranges on the steel portion of the iron-iron carbide phase diagram and discuss it elaborately.	8	2	3
		OR			
5	c.	Draw TTT diagram and discuss it elaborately. Throw some light on the term CCR.	8	1	3
	d.	Draw Hardening and Annealing temperature ranges on the steel portion of the iron-iron carbide phase diagram and discuss it elaborately.	8	4	3
6		Draw a well-labeled Iron-Iron Carbide Phase Diagram and discuss it elaborately.	16	4	3

Course Code: SOE-M-MTA104

O P JINDAL UNIVERSITY

I-Semester M.Tech (Manufacturing Technology & Automation) Examinations

INDUSTRIAL AUTOMATION AND ROBOTICS

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

All questions carry equal marks.

			M	CO	KL
Section-A					
1	a.	What is Industrial Automation	2	1	1
	b.	List out the advantages of Industrial automation	2	1	1
	c.	What is the purpose of Air service (FRL) unit in a pneumatic circuit?	2	2	1
	d.	Draw the symbol of 4/2 directional control valve	2	2	1
	e.	List various conveyor systems.	2	3	1
	f.	Identify the transfer mechanisms used in automated flow lines.	2	3	2
	g.	What are the functions of automated material handling systems?	2	4	1
	h.	What are the features of automated flow lines	2	4	1
	i.	What are the future applications of Robot	2	5	2
	j.	What is the function of non-return valve	2	5	2
Section-B:					
Unit-I					
2	a.	What are the different levels of automation? Discuss them briefly.	8	1	1
	b.	Discuss the various reasons for automation	8	1	2
OR					
3	a.	Discuss the USA principle in details	8	1	1
	b.	Discuss the various costs involved in manufacturing	8	1	3
Unit-II					
4	a.	What are the important hydraulic components used in automated system? Describe briefly.	8	2	2
	b.	Explain with suitable circuits, how the forward return motion of double acting cylinder can be controlled using direction control valves.	8	2	4
OR					
5	a.	With sketches, explain the various electrical components used in operation of pneumatic/hydraulic circuits	8	2	3
	b.	Explain the working principle of a PLC, showing any hydraulic circuit of automation using PLC.	8	2	4
Unit-III					
6	a.	Discuss the any one indexing mechanism used for linear or rotary motion in only one direction.	8	3	2
	b.	Explain with neat sketch any two drives used in CNC machines.	8	3	4
OR					

7	a.	Draw the neat sketches of cam mechanism and discuss briefly.	8	3	2
	b.	Discuss the applications of indexing mechanism in details with neat sketch	8	3	2
Unit-IV					
8	a.	What are the principles of material handling system? Describe the use of material handling equipment in machine tools.	8	4	3
	b.	What is AGVS?. Discuss different components of AGVS and AGVS Control system.	8	4	2
OR					
9	a.	Explain the role of AS/RS in material handling systems.	8	4	4
	b.	Explain the importance of automated work-in-process storage system.	8	4	2
UNIT-V					
10	a.	Discuss the Cartesian robot with its application.	8	5	2
	b.	Explain speed of motion and load carrying capacity in robots.	8	5	2
OR					
11	a.	Discuss the various factors on which accuracy of robot depends.	8	5	2
	b.	Discuss various methods used for programming robots	8	5	2

Course Code: SoE-M-MTA 105(3)

OP JINDAL UNIVERSITY, RAIGARH

END SEMESTER EXAMINATION, JUNE-2023

M.Tech 1st Semester - MTA

Branch: Mechanical Engineering - MTA

Manufacturing Management SoE-M-MTA 105(3)

Time: 4 Hrs. **Max. Marks: 100**

Note:

Answer any one question from each unit

All questions carry equal marks

			M	CO	KL
Section-A (20 marks)					
1	a.	Define Manufacturing Management? Give its practical example	2	1	1
	b.	What is mean by Industrialization and Globalization?	2	1	1
	c.	What is mean by Lean Manufacturing? give suitable examples	2	2	1
	d.	What is mean by Production? Enlist different types of production	2	2	1
	e.	What is mean by Product layout & Process Layout	2	3	1
	f.	Enlist the major component of Strategic Management	2	3	1
	g.	What is mean by MRP-1 & MRP-2 ? give suitable examples	2	4	1
	h.	What is mean by Cellular Manufacturing? give suitable examples	2	4	1
	i.	What is mean by PPC? what are its functions	2	5	1
	j.	What is mean by JIT? Enlist its advantages	2	5	1
Section-B: Unit-I (16 marks)					
2	a.	Perform SWOT analysis of your organisation. What strategic insights did you gain? Discuss with examples	8	1	3
	b.	What are the different types of Production? Where would each one of them be applicable? Discuss with examples?	8	1	3
OR					
3	a.	What is Kenchi Ohmae's 'Key success factors' theory and discuss its relevance to manufacturing strategy.	8	1	3
	b.	What is flexibility in operational function? Can it be one of the strategic weapons? Explain your view.	8	1	3
Unit-II (16 marks)					
4	a.	What is mean by Productivity? What are the different measures to increase the productivity of an Organisation	8	2	3
	b.	Productivity improvement is not a one-shot project? Do you agree with this statement? Discuss your answer.	8	2	3
OR					
5	a.	How people are important in an operation strategy? Discuss the needs to be done in your organisation in India, in general.	8	2	3
	b.	What is mean by PPC? Explain integrative nature of production plans with line diagrams.	8	2	3

Unit-III (16 marks)					
6	a.	What is mean by "five forces model" explain it with line diagram.	8	3	2
	b.	What is mean by Cost leadership? Difference between Traditional approach and Modern approach in detail.	8	3	2
OR					
7	a.	Explain what is mean by ERP? Enlist the different steps for ERP implementation?	8	3	3
	b.	What is mean by CRP? Explain 'Flow of information' in CRP with line diagram.	8	3	3
Unit-IV (16 marks)					
8	a.	What is flexibility in operation function? Can it be one of the strategic weapon? Support your answer with examples.	8	4	3
	b.	Explain 'Kanban Production Information system' with line diagram give its merits and demerits.	8	4	3
OR					
9	a.	What is JIT? Explain its role in automobile industry with practical examples.	8	4	3
	b.	What is VSM? Explain it with line diagram. What are its advantages and limitations? answer in the context of lean operations?	8	4	3
UNIT-V (16 marks)					
10	a.	Is there is the difference between the term "production management" and operation management? Support your answer with examples.	8	5	3
	b.	What is mean by FMS? Explain with block diagram	8	5	3
OR					
11	a.	What is mean by Waste (Muda)? Explain in detail seven types of Muda	8	5	3
	b.	Explain the difference in 'Lean' and 'Traditional thinking'. Is there is a difference in the Purposes? If so, what is it?	8	5	3