

Basic Electrical and Electronics [SOE-D-EE201]

Diploma – 2nd Semester
Mechanical Engineering

TIME: 02 Hrs
MAX MARKS: 60

Q1 All Questions are compulsory [2 marks x 6]

- Define resistor.
- Define inductor.
- Define capacitor.
- Draw the symbol and unit of capacitor?
- Write down the unit of power?
- What is the difference between DC and AC.

Q2 Answer any six questions [4 marks x 6]

- Define (i) form factor (ii) Peak factor?
- Define (i) power triangle (ii) impedance?
- What is the difference between dependent and independent current source.
- An inductive coil having inductance is 0.1H connected across 200V, 50Hz. Find inductive reactance?
- A capacitor has capacitance of 30F connected across 200V, 50Hz. Find capacitive reactance?
- An AC circuit consists of a pure resistance of 10Ω and is connected across an a.c. supply of 230V, 50Hz. Calculate current?.
- An AC circuit consists of a pure resistance of 5Ω and is connected across an a.c. supply of 210V, 50Hz. Write down the equation for voltage and current?

Q3 Answer any three questions [8 marks x 3]

- A coil having a resistance of 12Ω and an inductance of 0.1H is connected across a 100V, 50Hz supply. Calculate (i) inductive reactance (ii) impedance (iii) admittance (iv) current (v) power factor (vi) phase angle
- A coil of resistance 1.5Ω and inductive reactance of 6Ω is placed in series with a second coil of resistance 2Ω . When a voltage of 230V, 50Hz is applied to the circuit, the current flowing through the circuit is 7A. Find the inductance of the second coil.
- The circuits A and B are connected in parallel to a 230V, 50Hz supply. Circuit A consists of resistance of 20Ω in series with an inductive reactance of 20Ω and circuit B consists of resistance 40Ω in series with a capacitive reactance of 20Ω . Determine (i) current (ii) I_1 (iii) I_2 (iv) I (v) Z_1 (vi) Z_2 (vii) Y_1 (viii) Y_2 (ix) power factor
- Three similar coils each having a resistance of 10Ω and an inductance of 0.3H are connected in star to a 3-phase 50Hz supply, 200V between lines. Calculate the phase current, line current and the total power absorbed in each phase.
- Three similar coils each having a resistance of 12Ω and an inductance of 0.2H are connected in delta to a 3-phase 50Hz supply, 300V between lines. Calculate the line current. If they are now connected in delta, calculate the phase current, line current and the total power absorbed in each phase?

UNIVERSITY RAJGAH (U.R.)

MID-SEMESTER EXAMINATION MAY 2022

Basic Electrical and Electronics (EOL-14121)

Duration - 1 hour

Maximum Marks - 50

Roll No. _____

Answer all questions in brief.

1. Define the following terms: (10 marks)

(a) Electric circuit

(b) Node

(c) Branch

(d) Loop

(e) Mesh

2. A circuit consists of a 10V DC source, a 5Ω resistor and a 2A DC current source in parallel. Calculate the power absorbed by the 5Ω resistor. (5 marks)

3. Find the open-circuit voltage across the terminals A and B in the circuit shown below. (5 marks)

4. Calculate the effective value of the periodic waveform shown in the figure. (5 marks)

5. A series R-L circuit is connected to a 230V, 50Hz AC source. The power factor is 0.8 lagging. Calculate the value of the inductor reactance. (5 marks)

6. A 100W, 230V incandescent lamp is connected in series with a resistor to a 230V AC source. Calculate the value of the resistor. (5 marks)

7. A 100W, 230V incandescent lamp is connected in parallel with a resistor to a 230V AC source. Calculate the value of the resistor. (5 marks)

8. A 100W, 230V incandescent lamp is connected in series with a resistor to a 230V AC source. Calculate the value of the resistor. (5 marks)

9. A 100W, 230V incandescent lamp is connected in parallel with a resistor to a 230V AC source. Calculate the value of the resistor. (5 marks)

10. A 100W, 230V incandescent lamp is connected in series with a resistor to a 230V AC source. Calculate the value of the resistor. (5 marks)

Q1 All Questions are compulsory [2 marks x 6]

- Define accuracy of measuring instrument.
- Define resolution of measuring instrument.
- Define sensitivity of measuring instrument.
- What is gross error?
- What are the advantage of PMMI instrument?
- What is the turn ratio of transformer?

Q2 Answer any six questions [4 marks x 6]

- What type of error occur in the measuring instrument?
- Describe how to make extension of range of voltmeter?
- Explain CT and PT.
- Write the difference between the PMMC and PMMI instrument.
- Difference between the analog and digital instrument.
- Write down the advantage and disadvantage of PMMC instrument.
- What type of error occur in dynamometer instrument?
- What is clamp on ammeter, what is the purpose of use this type of instrument?

Q3 Answer any three questions [8 marks x 3]

- Define the terms “Indicating instruments”, “Recording instruments” and “Integrating instruments”.
Give suitable example for each case.
- Explain construction and working of permanent magnet moving coil (PMMC) instrument with diagram. Also derive the torque equation, explain merits & demerits, & their applications.
- Explain the construction of electrodynamic instrument with neat diagram.
- Explain construction and working of permanent magnet moving iron (PMMI) repulsion type instrument with diagram. Also derive the torque equation, explain merits & demerits, & their applications.
- What type of torque produce in the measuring instrument?

O P JINDAL UNIVERSITY, RAIGARH (C.G.)

MID SEMESTER EXAMINATION, MAY-2022

Engineering Mechanics [SoE-D-ME202]



Diploma 2nd Semester
BRANCH : Common to All

TIME: 02 Hrs
MAX MARKS :60

Note: Write legibly and draw neat sketches.

Q1 Answer any five Questions [2 marks x 5]

- What is Equilibrium condition for a Concurrent force system?
- State Lami's theorem.
- What is rigid body?
- Write the formula for Moment of Inertia of a rectangle about its centroidal X axis and another parallel axis through its base.
- What is moment?
- What is force and different types of force systems?

Q2 Answer any five questions [10 marks x 5]

- The resultant of two forces, one of which is double the other is 260 N. If the direction of the larger force is reversed and the other remain unaltered, the magnitude of the resultant reduces to 180 N. Determine the magnitude of the forces and the angle between the forces.
- The resultant of two forces $F_1 = 400$ N and $F_2 = 260$ N acting at point A is 520 N. Determine the angle between the two forces and the angle between the resultant and force F_1 .
- Explain Principle of Transmissibility. Determine the resultant of the three forces acting on a hook as shown in **figure 1**.
- Draw the free body diagram of the ladder shown in **figure 2**. Calculate the force P required to keep the 10 m long and 400 N weight ladder in equilibrium.
- Locate the centroid of the given section in **figure 3**.
- State parallel axes theorem and find the Moment of Inertia of a rectangle about its base. Also, find the Moment of Inertia of a right angle triangle of base 60mm and height 45 mm about the base.

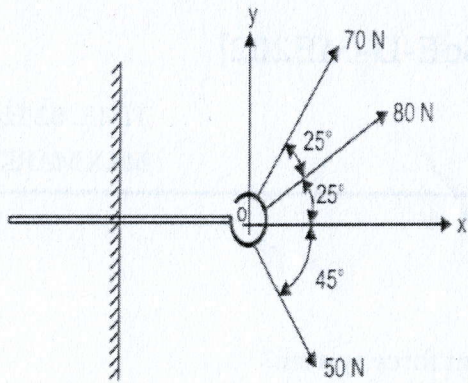


Figure 1

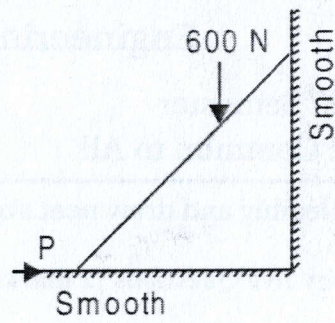
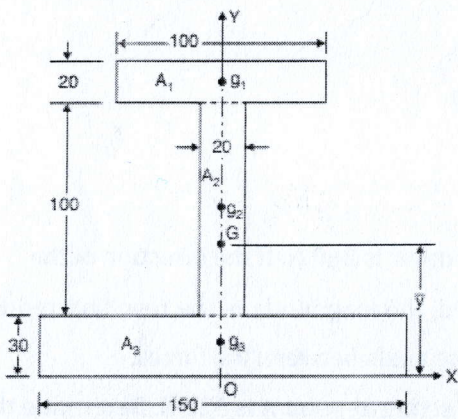


Figure 2



All dimensions in mm

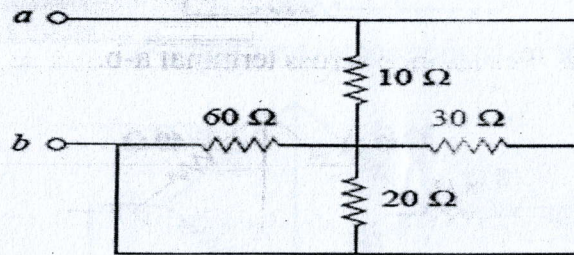
Figure 3

Q1. All Questions are compulsory [2 marks x 6]

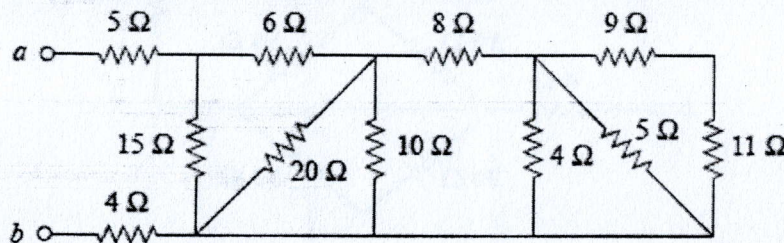
- Draw the symbol of resistor, capacitor, inductor and diode.
- What do you understand by current, voltage, power and energy (write their unit of measurements)?
- Write the statement of OHM'S law.
- Write down the statement for KCL & KVL.
- Write down the formula of energy, power, capacitive voltage and inductive voltage.
- What are the different components of electrical circuits?

Q2. Answer any six questions [4 marks x 6]

- Define branch, node, junction, loop & mesh of any electrical circuits.
- Write the conversion formula of source transformation with diagram.
- If a circuit having load with resistance of 25Ω , current through the circuit is 13 A. What will be the value of voltage drop across the load.
- If three resistors are connected in series has equal resistance of 150Ω each. Determine the equivalent resistance of the circuit.
- If three resistors of 200Ω are connected in parallel, determine the equivalent resistance of the circuit.
- Determine the equivalent resistance across terminal a-b.

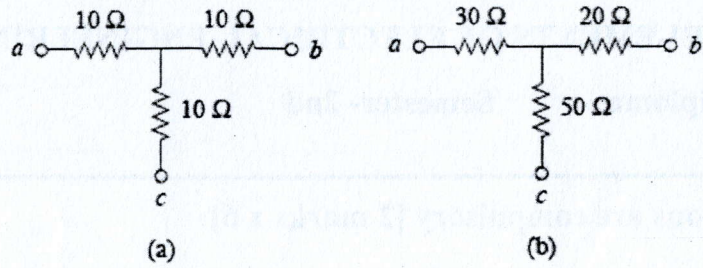


- Determine the equivalent resistance across terminal a-b.

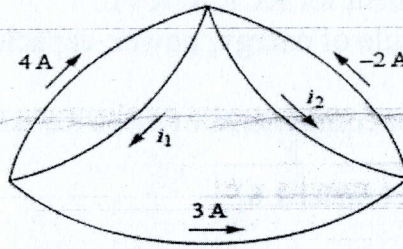


Q3. Answer any three questions [8 marks x 3]

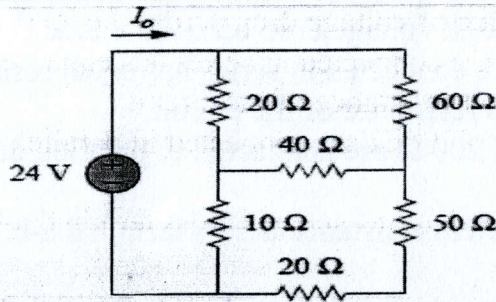
a) Transform circuit to star to delta.



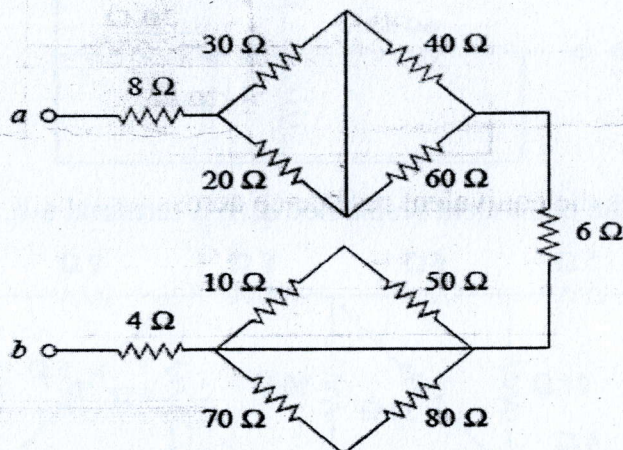
b) Determine current i_1 and i_2 in the circuit.



d) Determine I_0 current in the circuit.



e) Determine equivalent resistance across terminal a-b.



THERMAL ENGINEERING [SOE-D-ME203]

DIPLOMA – 2nd Semester
MECHANICAL

TIME: 02 Hrs
MAX MARKS: 60

PART - I (All questions are compulsory) (2*6 = 12 Marks)

1. What is a thermodynamic system? (2)
2. What is the zeroth law of thermodynamics? (2)
3. What do you understand by the term "thermodynamic process"? (2)
4. What are positive and negative work interactions? (2)
5. Which property is introduced by the first law of thermodynamics? (2)
6. Define the specific heat at constant volume and constant pressure. (2)

PART - II (Attempt any 6 questions) (4*6 = 24 Marks)

7. Derive the expression for work done during an adiabatic process for a closed system. (4)
8. What do you understand by intensive and extensive properties? Explain with proper examples. (4)
9. A force of 1000 N is applied uniformly on a piston of 10 cm diameter. Determine the pressure acting on the piston in bar. (4)
10. Explain mechanical, thermal and chemical equilibrium. (4)
11. What do you understand by path function and point function? Mention the key differences between them. (4)
12. State the first law of thermodynamics for a closed system undergoing (a) cycle (b) process. (4)
13. Convert the following: (4)
(a) -20 °C to Kelvin (b) 2.5 bar to kPa (kilo pascal) (c) 10 litre to m³

PART - III (Attempt any 3 questions) (8*3 = 24 Marks)

14. A mass of 8 kg gas expands within a flexible container so that the p-v relationship is of the form $pv^{1.2} = \text{constant}$. The initial pressure is 1000 kPa and the initial volume is 1 m³. The final pressure is 5 kPa. If the specific internal energy of the gas decreases by 40 kJ/kg, find the heat transfer in magnitude and direction. (8)
15. Derive the steady flow energy equation. (8)
16. A piston and cylinder machine contains a fluid system which passes through a complete cycle of four processes. During a cycle, the sum of all heat transfers is -170 kJ. The system completes 100 cycles/min. Complete the following table and compute the net rate of work output in kW. (8)

Process	Q (kJ/min)	W (kJ/min)	ΔE (kJ/min)
1-2	0	2170	-----
2-3	21000	0	-----
3-4	-2100	-----	-36600
4-1	-----	-----	-----

17. A gas undergoes a thermodynamic cycle consisting of three processes beginning at an initial state where $p_1 = 1$ bar, $V_1 = 1.5$ m³ and $U_1 = 512$ kJ. The processes are as follows: (8)
- (a) Process 1-2: compression with $pV = \text{constant}$ to $p_2 = 2$ bar, $U_2 = 690$ kJ
 - (b) Process 2-3: $W_{2-3} = 0$, $Q_{2-3} = -150$ kJ, and
 - (c) Process 3-1: $W_{3-1} = +50$ kJ
- Determine the heat interactions Q_{1-2} and Q_{3-1}
18. Discuss in detail about the three Gas laws i.e. – Charles law, Boyle’s law and Gay Lussac law. (8)

MATHEMATICS-II

SUBJECT CODE: SOE-D-SS201

TIME: 02 HOURS

MAX MARKS: 60

DIPLOMA - 2nd Semester

Section - A (Attempt All , 2 Marks each)

2×6=12

Q.1 Define a diagonal matrix with example.

Q.2 Write the order and degree of differential equation :

$$\frac{d^2y}{dx^2} + \frac{dy}{dx} + a^2y = 0$$

Q.3 If $A = \begin{bmatrix} 2 & 6 & 1 \\ 2 & 0 & 5 \\ 1 & 8 & 3 \end{bmatrix}$ then find the minor of the element 3.

Q.4 Define symmetric matrix with example.

Q.5 If $(5x^4 + 3x^2y^2 - 2xy^3) dx + (2x^3y - 3x^2y^2 - 5y^4) dy = 0$ then check the differential equation is exact or not?

Q.6 Define scalar matrix with example.

Section - B (Answer any 6 questions, 4 Marks each)

4×6 = 24

Q.1 Find the differential equation of

$$y = A \cos x + B \sin x$$

Q.2 If $A = \begin{bmatrix} 1 & 2 & 3 \\ 5 & 9 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 0 & 1 \\ 2 & 4 & 2 \end{bmatrix}$ then find $2A - B$.

Q.3 Solve $(2xy + 3y) dx + (x^2 + 3x) dy = 0$

Q.4 Solve $(x+1) \frac{dy}{dx} = x(y^2 + 1)$.

Q.5 Find the determinant of A if $A = \begin{bmatrix} 6 & 2 & 3 \\ 2 & 3 & 5 \\ 4 & 2 & 1 \end{bmatrix}$

Q.6 If $A = \begin{bmatrix} 2 & 1 & 2 \\ 3 & 4 & 0 \\ 3 & 1 & 5 \end{bmatrix}$ then find the value of A^2 .

Q.7 Solve $x \frac{dy}{dx} - 3y = x^2$.

Section - C (Answer any 3 questions, 8 Marks each)

8×3=24

Q.1 Solve the differential equation $\frac{dy}{dx} = \frac{x-y}{x+y}$

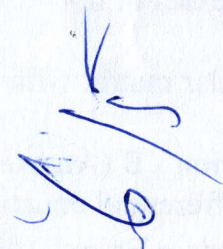
Q.2 Find the inverse of the matrix $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$

Q.3 Solve $(x^2 + y^2) dx - 2xy dy = 0$

Q.4 If $A = \begin{bmatrix} 2 & 1 & -3 \\ 1 & 0 & 5 \\ -2 & 4 & 1 \end{bmatrix}$ then find the value of $A^2 + 2A + 3I$, where I is unit matrix of

order 3.

Q.5 If $A = \begin{bmatrix} 1 & -2 & 3 \\ 2 & 3 & -1 \\ -3 & 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 2 \\ 1 & 2 & 0 \end{bmatrix}$ then show that $AB \neq BA$



O P JINDAL UNIVERSITY, RAIGARH (C.G.)

MID SEMESTER EXAMINATION, MAY-2022

Engineering Mechanics [SoE-D-ME202]



Diploma 2nd Semester

BRANCH : Common to All

TIME: 02 Hrs

MAX MARKS :60

Note: Write legibly and draw neat sketches.

Q1 Answer any five Questions [2 marks x 5]

- What is Equilibrium condition for a Concurrent force system?
- State Lami's theorem.
- What is rigid body?
- Write the formula for Moment of Inertia of a rectangle about its centroidal X axis and another parallel axis through its base.
- What is moment?
- What is force and different types of force systems?

Q2 Answer any five questions [10 marks x 5]

- The resultant of two forces, one of which is double the other is 260 N. If the direction of the larger force is reversed and the other remain unaltered, the magnitude of the resultant reduces to 180 N. Determine the magnitude of the forces and the angle between the forces.
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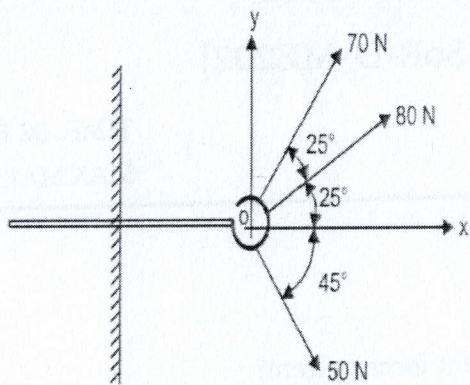


Figure 1

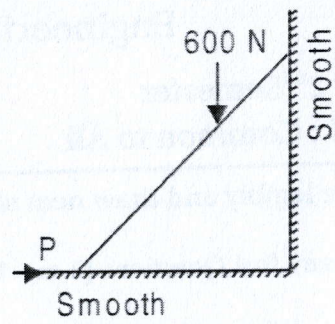


Figure 2

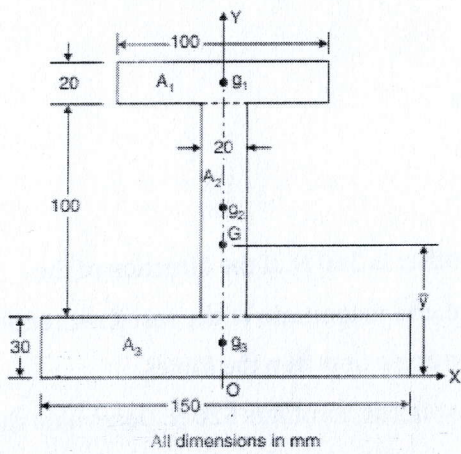


Figure 3

MINERAL DRESSING [SOE-D-MT205]

COURSE- DIPLOMA

Semester - 2nd

TIME:2 Hours

BRANCH: METALLURGICAL ENGINEERING

MAX MARKS:60

Note: Answer ALL questions from Question No.1 and answer any SIX questions from Question No.2 and Any THREE questions from Question No.3. Mark your answers with VALID QUESTION NUMBER.

Q1. All Questions are compulsory

[2 Marks x 6 = 12]

- What are the rich sources of calcareous materials and siliceous minerals?
- What is gangue material?
- Define Mineral?
- Provide two examples of hardest mineral.
- Define the term 'crushing'.
- Explain the term 'Reduction Ratio'.

Q2. Answer any SIX Questions

[4 Marks x 6 = 24]

- Differentiate between minerals and ores.
- Explain various processes involved in mineral processing.
- Differentiate metallic and non-metallic minerals with suitable examples.
- Write physical properties of mineral.
- Explain Kick's law and Bond's law.
- Explain the principle of crushers?
- Define 'Angle of Nip' and also discuss its significance?

Q3 Answer any THREE Questions

[8 Marks x 3 = 24]

- State the fundamental characteristics of minerals.
- What are the advantages and disadvantages of mineral processing?
- Write brief note on working principle of Roll crusher with suitable diagram.
- Explain the term 'Comminution' and the steps involved with this.
- Compare jaw crusher and gyratory crusher.

