

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur (GIET University)



B. Tech (Second Semester - Regular) Examinations, April 2026
25FYES10002 – Elements of Mechanical Engineering
(Common to All)

Time: 3 hrs

Maximum: 60 Marks

(The figures in the right hand margin indicate marks)

PART – A**(2 x 5 = 10 Marks)**Q.1. Answer **ALL** questions

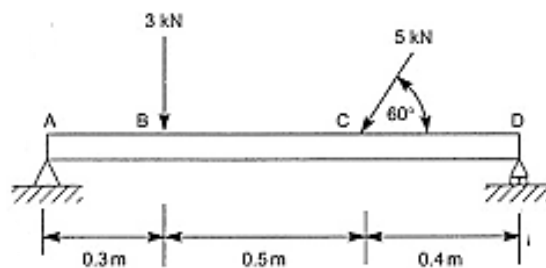
- Define surface tension. Write its unit.
- Recall centroid and center of gravity.
- State Pascal's law.
- Define perfect and imperfect truss.
- Describe coplanar and concurrent forces.

CO #	Blooms Level
CO4	K1
CO2	K1
CO4	K1
CO3	K1
CO1	K1

PART – B**(10 x 5 = 50 Marks)**Answer **ALL** the questions

- Derive the expression of the resultant force for two forces acting a point using parallelogram law of forces.
- Calculate the reaction forces at A and B for the given figure in which there is hinge support at A and roller support at D.

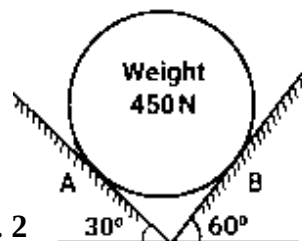
Marks	CO #	Blooms Level
5	CO1	K2
5	CO1	K3

Fig. 1

(OR)

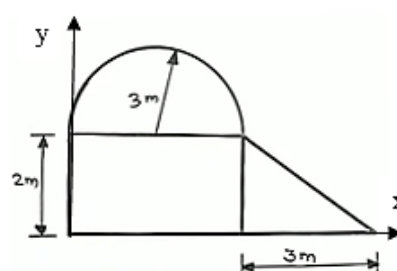
- Determine the magnitude and direction of the resultant force for the given system of forces-
 - 40 N inclined at 30° towards North of East
 - 50 N North
 - 60 N North-West
 - 70 N inclined at 45° towards South of West

2+3 CO1 K2

Fig. 2

- A 450 N weight ball rests on a groove as shown in Fig. 2. Determine the contact reactions at A and B.
- Write the assumptions of a truss analysis.
 - Calculate the centroid of given shape in Fig. 3 in which all the dimensions are in mm.

5	CO1	K3
4	CO3	K2
6	CO2	K3

Fig. 3

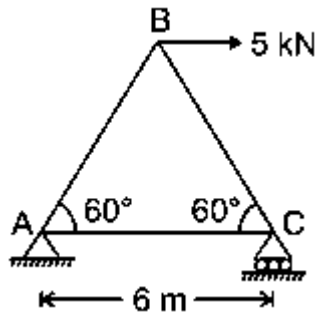
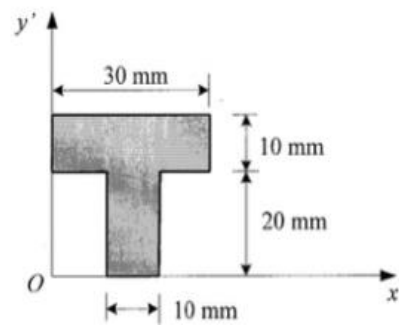


Fig. 4 Fig. 5



(OR)

- | | | | |
|---|-----|-----|----|
| c. Calculate the forces in the members AB, BC and AC of the given truss in Fig. 4 . | 6 | CO3 | K3 |
| d. Calculate the centroid of given shape in Fig. 5 . | 4 | CO2 | K3 |
| 4.a. Calculate the absolute pressure of the following pressures in Pa when the barometer reads 765 mm of Hg- | 5 | CO4 | K2 |
| i) 250 mm of Hg, vacuum ii) 350 cm of water, gauge | | | |
| b. Difference between Microscopic Approach and Macroscopic Approach | 5 | CO5 | K1 |
| (OR) | | | |
| c. Explain the different modes of heat transfer with two examples each. | 6 | CO5 | K1 |
| d. Calculate the weight, specific weight, mass of a liquid having a specific gravity of 0.9 and a volume 1 cubic metre. | 4 | CO4 | K2 |
| 5.a. Explain the working of 4 Stroke IC Engine with diagram. | 10 | CO6 | K2 |
| (OR) | | | |
| b. Explain the statements of 2nd law of thermodynamics. Write the limitations of 1st law. | 4+1 | CO6 | K1 |
| c. Difference between heat pump and refrigerator. A refrigerator has a COP of 3.0. If it requires 500J of work per cycle, how much heat per cycle does it remove from cold reservoir? How much heat is supplied to the hot reservoir? | 2+3 | CO6 | K2 |
| 6.a. If a gas of volume 6000 cm ³ and at a pressure of 100kPa is compressed quasistatically according to $pV^2 = \text{constant}$ until the volume becomes 2000 cm ³ , determine the final pressure and work transfer. | 5 | CO5 | K3 |
| b. State the statements of 1st law of Thermodynamics. In a cyclic process, heat transfers are +14.7 kJ, -25.2 kJ, -3.56 kJ and +31.5 kJ. What is the net work for cyclic process? | 3+2 | CO6 | K2 |
| (OR) | | | |
| c. A blower handles 1 kg/sec of air at 20°C and consumes a power of 15 kW. The inlet and outlet velocities of air are 100 m/sec and 150 m/sec respectively. Find the exit temperature assuming the adiabatic conditions. Take C_p for air=1.005 kJ/kgK. Use $h = C_p \cdot T$ | 5 | CO6 | K3 |
| d. A new scale P of temperature is divided in such a way that the freezing point of ice is 100°P and the boiling point is 400°P. What is the temperature reading on this new scale when the temperature is 150°C and 400 K? | 5 | CO5 | K2 |

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