QP Code: R251A006 Reg. No | | | | | | | | | | AY 23

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

B. Tech(First Semester - Regular) Examinations, December 2025

25FYES10002 - Elements of Mechanical Engineering

(Common to All branch)

Time: 3 hrs Maximum: 60 Marks

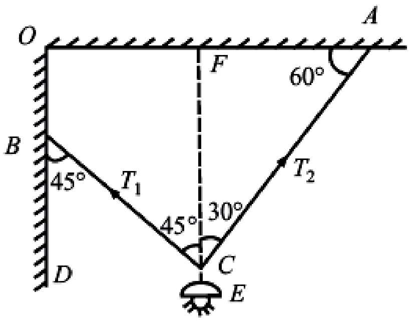
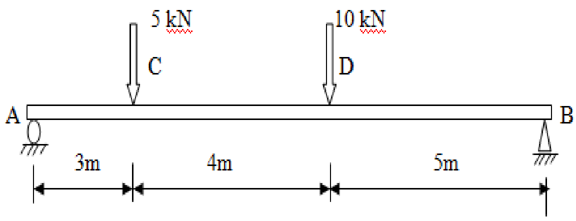
Answer ALL questions

(The figures in the right hand margin indicate marks)

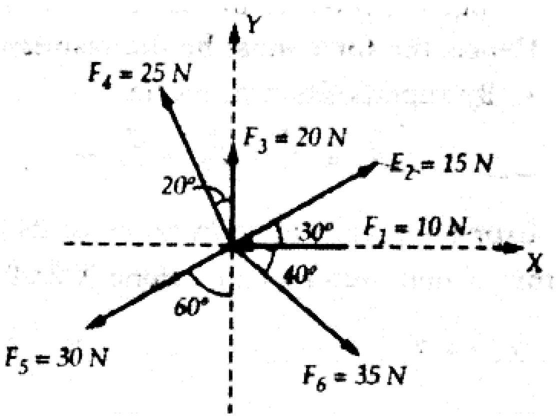
PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions		CO #	Blooms Level
a.	Define free body diagram? Explain it with a suitable example.	1	K1
b.	Define the terms centroid and centre of gravity (CG).	2	K1
c.	Explain surface tension and provide one practical example of it.	4	K2
d.	Differentiate point function and path function with suitable example.	5	K2
e.	What is a PMM-2 , and which law of thermodynamics does it violate?	6	K1

PART – B **(10 x 5=50 Marks)**

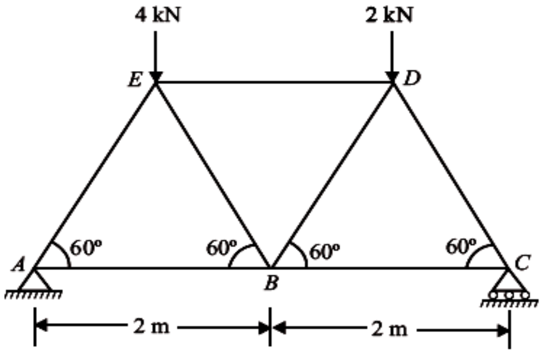
Answer ***ALL*** the questions		Marks	CO #	Blooms Level
2. a.	State and prove parallelogram law of forces.	5	1	K2
b.	An Electric light fixture weighing 15N hangs from a point C, by two strings AC and BC. AC is inclined at 60^0 to the horizontal and BC at 45^0 to the vertical as shown in figure, Determine the forces in the strings AC and BC 	5	1	K3
	(OR)			
c.	Find the Reaction at A and B. 	5	1	K2

d. Calculate the magintitude and direction of the resultant force of the given force system



5 1 K3

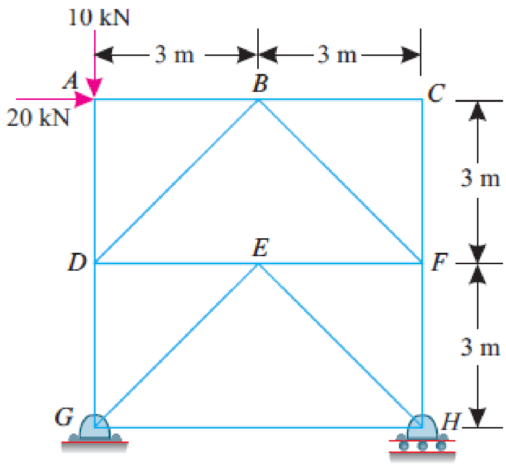
3.a. Determine the reaction and the forces in each member of a simple triangle truss supporting two loads as shown in figure.



10 3 K3

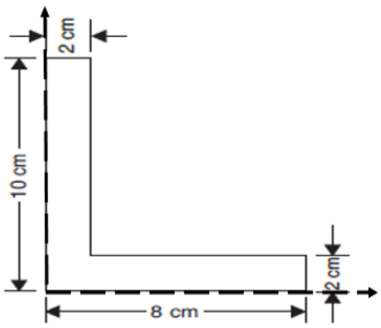
(OR)

b. A truss is subjected to two point loads at A as shown in Fig.. Find, the forces in all the members of the truss.



10 3 K3

4.a. Determine the centroid of the lamina as shown in Figure.



5 2 3

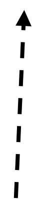
b. Calculate the specific weight, density and specific gravity of one litre of liquid which weight is 7N.

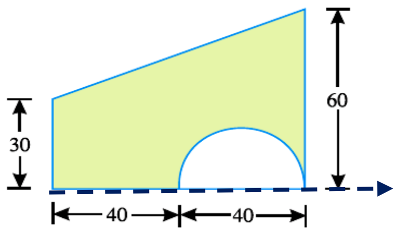
5 4 K2

(OR)

c. Determine the centroid of the given lamina as shown in figure.

5 2 K3





d.	If the velocity distribution over a plate is given by $u = \frac{2}{3}y - y^2$ in which u is velocity in metre per second at a distance y metre above the plate, determine the shear stress at y = 0 and y = 0.15 m. Take dynamic viscosity of fluid as 8.63 poises.	5	4	K2
5.a.	Write the differences for microscopic and macroscopic approach in thermodynamics.	5	5	K1
b.	During working stroke of an engine, the heat transfer out of the system was 150 kJ/Kg of working substance. The internal energy also decreased by 400 kJ/Kg of working substance. Determine the work done and state whether the work is done by or on the system.	5	5	K2
	(OR)			
c.	Define Heat Transfer. Explain different modes of heat transfer.	5	5	K1
d.	6 kg of air compressed adiabatically from 2 bar, 6 m^3 to 4 m^3. Calculate the work done and heat transfer during this process $\gamma = 1.4$ for air	5	5	K2
6.a.	In a turbine, fluid enters at a rate of 5 kg/s where the initial velocity is 20 m/s and the outlet velocity is 15m/s. If the heat rejected by the turbine is 12 kJ/s. Calculate the rate of work transfer. The specific enthalpy of the fluid is decreased by 90 kJ/kg. Neglect the elevation change.	5	6	K3
b.	An inventor claims to have developed an engine that takes 105MJ of heat from a source of 400K and rejects 42 MJ of heat to a sink of 200 K respectively. Would you advise to invest the money on this engine in the market?	5	6	K3
	(OR)			
c.	With a neat sketch, explain the working principle of a four stroke internal combustion (IC) engine.	10	6	K3

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