



GIET UNIVERSITY, GUNUPUR - 765022
B. Tech (Second Semester) Examinations, May - 2024
23BBSES10002 - Elements of Mechanical Engineering
 (Common to all branches)

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

- | | |
|---|--|
| <p>a. What is the free body diagram? Explain it with a suitable example.</p> <p>b. Differentiate between static and dynamic friction.</p> <p>c. Define intensive and extensive properties with examples.</p> <p>d. What is a PMM1? Why is it impossible?</p> <p>e. Write down the various benefits of industrial robot.</p> | <p>CO # Blooms Level</p> <p>CO1 K2</p> <p>CO3 K2</p> <p>CO4 K1</p> <p>CO5 K1</p> <p>CO6 K1</p> |
|---|--|

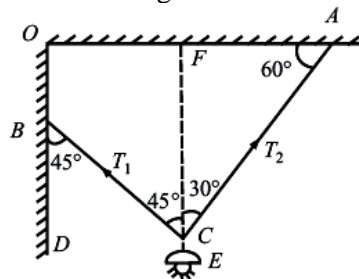
PART - B

(10 x5=50 Marks)

Answer **ALL** questions

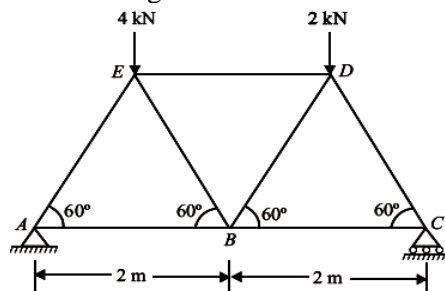
2. a. Find the magnitude of two forces such that if they act at right angle their resultant is $\sqrt{10}$ KN, While they act at an angle of 60° , their resultant is $\sqrt{13}$ KN.
- b. An Electric light fixture weighing 15N hangs from a point C, by two strings AC and BC. AC is inclined at 60° to the horizontal and BC at 45° to the vertical as shown in figure, Determine the forces in the strings AC and BC

Marks	CO #	Blooms Level
5	CO1	K3
5	CO1	K3



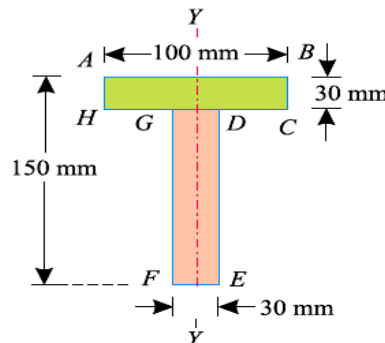
(OR)

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



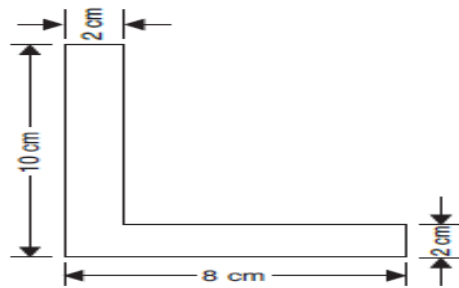
10	CO1	K3
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- 3.a. Find the centroid of a 100 mm x 150 mm x 30 mm T-section.

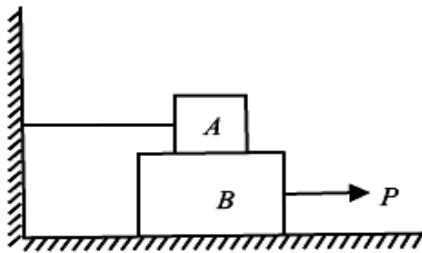


5	CO2	K3
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- b. Define friction. Write down the various laws of friction. 5 CO3 K1
 (OR)
 c. Find the centroid of the lamina as shown in Figure.



- d. Block A weighing 1000N rests over block B which weights 2000N as shown in figure. Block A is tied to wall with a horizontal string. If the coefficient of friction between A and B is $1/4$ and between B and floor is $1/3$, what should be the value of P to move the block B, if P is applied horizontally.



- 5 CO2 K3
 5
 CO3 K3
 5
 4.a. What is Heat Transfer? Explain different modes of heat transfer. 5 CO4 K2
 b. Calculate the volume of the vessel which contains 4.5 kg of Nitrogen at 5bar, 60°C . 5 CO4 K3
 (OR)
 c. An ideal gas of volume 0.2 m^3 at a pressure of 2 Mpa and 600K is expanded isothermally to 5 times of initial volume. Calculate work done by the gas. 5 CO4 K3
 d. During working stroke of an engine, the heat transfers 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 CO4 K3
 5.a. With neat sketch Explain the working principle of 4 stroke IC engine. 10 CO5 K2
 (OR)
 b. A nozzle is a device for increasing the velocity of a steady flowing fluid. At the inlet to a certain nozzle, the enthalpy of the fluid passing is 3000kJ/kg and the velocity is 60 m/s. At the discharge end, the enthalpy is 2762kJ/kg . The nozzle is horizontal and there is negligible heat loss from it. Calculate-
 i) Velocity at the exit of the nozzle. 10 CO5 K3
 ii) If the inlet area is 0.1m^2 and specific volume is $0.187\text{m}^3/\text{kg}$, find mass flow rate. I
 iii) ii) The specific volume at the nozzle exit is $0.498\text{m}^3/\text{kg}$, find the exit area of the nozzle
 6.a. Convert the following reading of pressure to Kpa assuming that the Barometers reading in 760 mm of Hg 6 CO6 K3
 i) 40 cm of HG vacuum ii) 1.2 met of H_2O gauge
 b. Find the surface tension in a soap bubble of 40 mm diameter, when the inside pressure is 0.5 N/m^2 above atmospheric pressure. 4 CO6 K3
 (OR)
 c. Explain briefly about the basic components of CNC Machine. 5 CO6 K2
 d. Write A note on "Flexible Manufacturing System (FMS)". 5 CO6 K2

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