



GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (First Semester) Examinations, February – 2022

21BBSES10002 – Elements of Mechanical Engineering

(Common to all branches)

Time: 3 hrs

Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A

(2 x 5 = 10 Marks)

Q.1. Answer **ALL** questions

CO# Bloom's Level

- Define and specify a force.
- State Lami's theorem. Illustrate the forces with a mathematical equation.
- Sketch and define an Equilibrant.
- Sketch P-V and T-S diagram for a polytropic process
- What do you understand by CNC. State the significance of G and M codes.

L1
L1
L1
L1
L1

PART – B

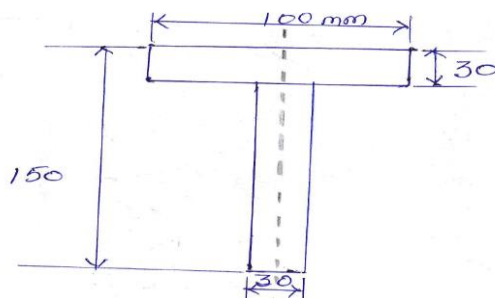
(15 x 4 = 60 Marks)

Answer **ALL** the questions

Marks CO # Blooms Level

- State parallelogram law of forces with its corollaries. Two forces of 100 N and 150 N are acting simultaneously at a point. What is the resultant of these two forces, if the angle between them is 45° ?
 - Find the centre of gravity of a $100 \text{ mm} \times 150 \text{ mm} \times 30 \text{ mm}$ T-section shown below.

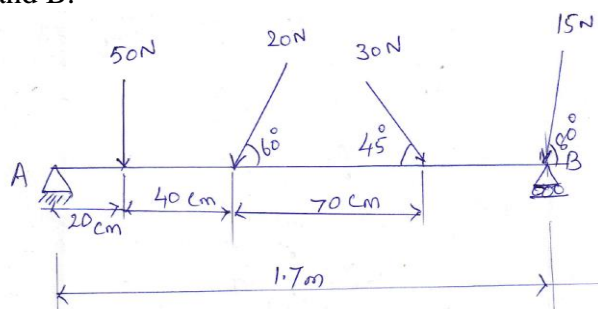
8 CO1 L3
7 CO1 L3



(OR)

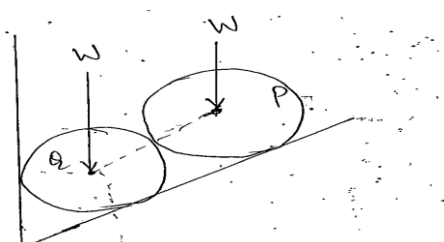
- A beam AB 1.7m long is loaded as shown in Fig. below. Determine the reactions at A and B.

8 CO1 L4

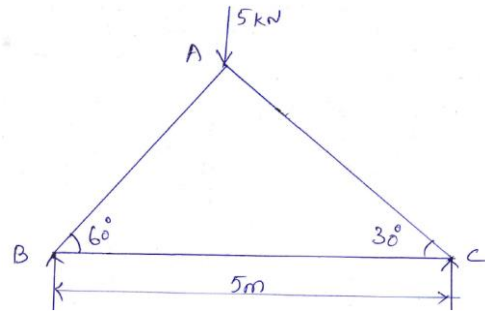


- Two identical rollers P and Q, each of weight W , are supported by an inclined plane and a vertical wall as shown in Fig. below. Assume all the surfaces to be smooth. Draw the free body diagrams of:
 - roller Q, (ii) roller P and (iii) rollers P and Q taken together.

7 CO1 L3



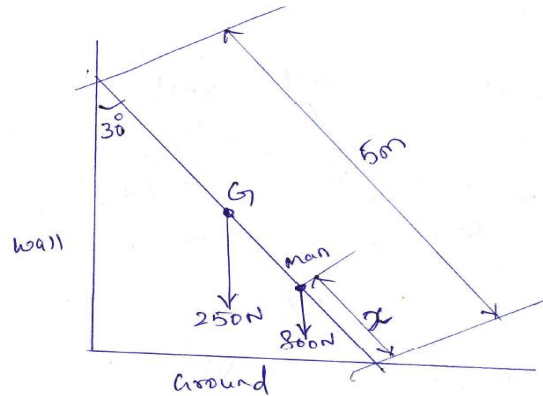
- 3.a. Find the forces in the members AB, AC and BC of the truss as shown in Figure. 8 CO2 L4



- b. Define the terms: i) Friction ii) limiting force of friction iii) co-efficient of friction iv) angle of friction 7 CO2 L2

(OR)

- c. A ladder 5m long and 250N weight is placed against a vertical wall in a position where its inclination to the vertical is 30° as shown in the figure below. A man weighing 800 N climbs the ladder. At what position will he induce slipping? The co-efficient of friction for both the contact surfaces of the ladder i.e., with the wall and the floor is 0.2. 8 CO2 L4



- d. Explain the terms i) Perfect truss, ii) Imperfect truss iii) deficient truss iv) redundant truss. 7 CO2 L2
- 4.a. Explain as steady flow system. Show with a neat diagram that total energy remains constant. 8 CO3 L3

- b. A gas occupies a volume of 0.1 m^3 at a temperature of 20°C and a pressure of 1.5 bar. Find the final temperature of the gas, if it is compressed to a pressure of 7.5 bar and occupies a volume of 0.04 m^3 . 7 CO3 L3

(OR)

- c. Enumerate the applications of Steady Flow Energy Equations in Engineering System. Apply SFEE for a boiler. 8 CO3 L3
- d. 0.1 m^3 of air at a pressure of 1.5 bar is expanded isothermally to 0.5 m^3 . Calculate the final pressure of the gas and heat supplied during the process. 7 CO3 L3
- 5.a. Explain Automation and Robotics with examples. 8 CO4 L2
- b. Explain with a block diagram CNC machine. What are advantages of CNC machines? 7 CO4 L2

(OR)

- c. What is a Robot? Classify Robots. 8 CO4 L2
- d. Explain the Concept CNC system. What are the disadvantages of CNC machines. 7 CO4 L2

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