

July-22-00198

B. Tech. EXAMINATION, 2022

Semester I (CBCS)

ENGINEERING MECHANICS

ME-101

Time : 3 Hours

Maximum Marks : 60

*The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.*

**Note :** Attempt *Five* questions in all, selecting *one* question from each Sections A, B, C and D. Q. No. 9 is compulsory.

### Section A

1. Determine the magnitude of the resultant force and its direction, measured counter-clockwise from the positive X-axis (Fig. 1). 10

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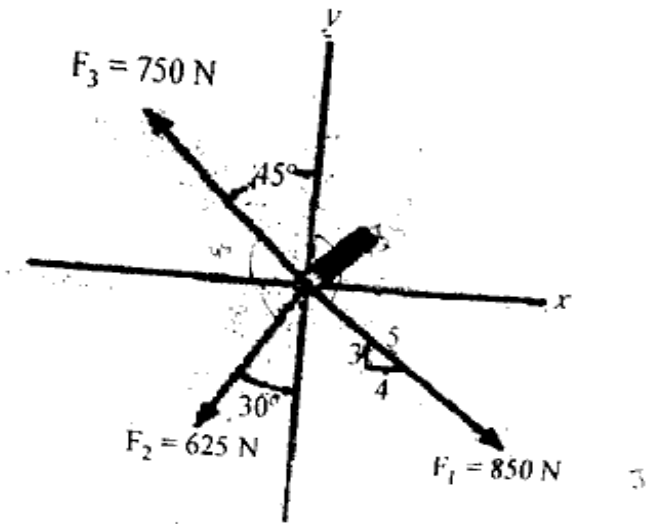


Fig. 1

2. State and derive the parallelogram law. Also discuss the law with special cases. 10

### Section B

3. Define Friction. State laws of friction. What is angle of friction, angle of repose and cone of friction ? Explain with examples. 10
4. Find the centroid of the composite section. Also find moment of inertia of the section shown in Fig. 2 about horizontal and vertical axis through the centroid. 10

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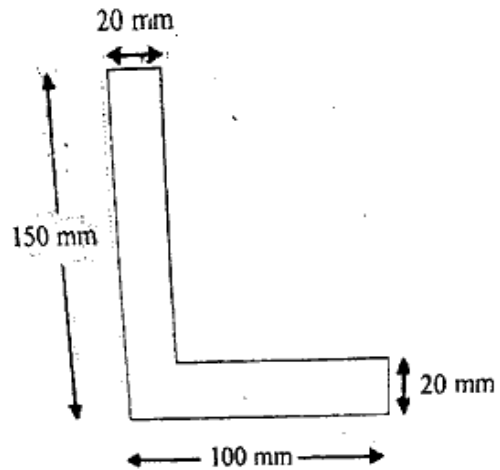


Fig. 2

Section C

5. Determine the forces in all the members of the frames shown in Fig. 3. Indicate the nature of the forces also. 10

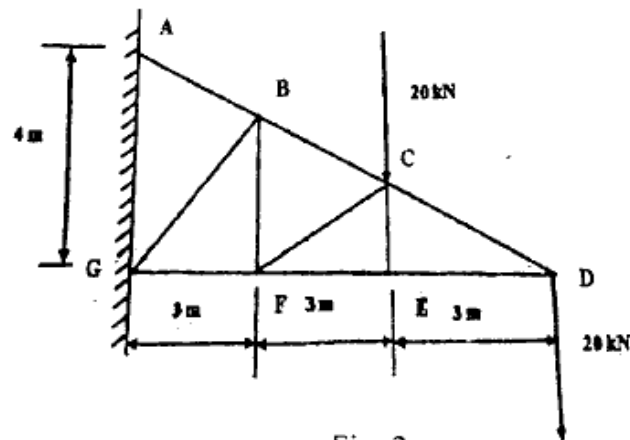


Fig. 3

6. Draw the shear force and bending moment diagram for the beam shown in Fig. 4 : 10

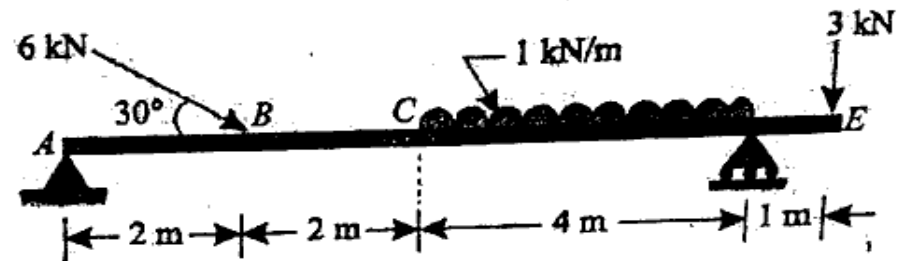


Fig. 4

Section D

7. Define rectilinear motion. The motion of a particle moving along a straight line is expressed as,  $x = t^3 - 13.8t^2 + 39.92t - 19.2$  where  $x$  is in metres and  $t$  in seconds. 10
- (i) Plot motion curves from  $t = 0$  to  $t = 5$  s with  $\Delta t = 1$  s
  - (ii) Find  $x$ ,  $v$ ,  $a$  when  $t = 0$
  - (iii) Find  $x$ ,  $a$  when  $v = 0$ .
8. State and explain D'Alembert's principle. A lift has an upward acceleration of  $2.5 \text{ m/s}^2$ . What pressure will a man of weight 800 N exert on a floor of the

lift ? Determine the pressure he would exert if the lift has an acceleration of  $2.5 \text{ m/s}^2$  downwards. Also determine the upward acceleration to cause the weight to exert a pressure of 1200 N on the floor. Assume  $g = 9.81 \text{ m/s}^2$ . **4+6=10**

**(Compulsory Question)**

9. (a) Define Moment of a Force. Also give the SI units.
- (b) What are rigid bodies ? What are conditions of equilibrium for a rigid body ?
- (c) Define coefficient of static friction with its mathematical expression.
- (d) Define Triangle law of forces.
- (e) Differentiate between centroid and centre of gravity.
- (f) State the perpendicular axis theorem.
- (g) Explain the concept of friction with example.
- (h) State Polygon law of forces.
- (i) What is a fixed support and what are the reactions acting on a fixed support ?
- (j) List different types of beams with neat sketch.

**10×2=20**