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OLE-3073

B. Tech. 3rd Semester (ME) Examination – April, 2021

ENGINEERING MECHANICS

Paper : ESC-ME-209-G

Time : Three Hours] *[Maximum Marks : 75*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Question **1** is ***compulsory*** and of short answers type. Each question carries equal marks (15 marks). Students have to attempt 5 questions in total at least ***one*** question from each Section.

1. (a) State the Varignon's principle of moments.

(b) How would you find out the center of gravity of a section, with a cut out hole ?

(c) A hollow semicircular section has its outer and inner diameter of 200 mm and 120 mm respectively. What is it's moment of inertia about its base AS ?

(d) Define perpendicular axis theorem.

(e) Distinguish clearly between uniformly distributed load, uniformly varying load and triangular load.

(f) Difference between Redundant and Deficient truss. $2.5 \times 6 = 15$

SECTION – A

2. A force F acts at the origin of a coordinate system in a direction defined by the angles $\theta_x = 68°$ and $\theta_z = 55°$. The component of force F along y direction is - 125N. find out :

(a) angle θ_y

(b) magnitude of force F

(c) component of force along X and Z direction

(d) component of force on a line that passes through the origin and point (1, 1, 1). 15

3. (a) State and prove Lami's theorem. 7.5

(b) Three forces acting on a particle are in equilibrium. The angle between the first and second is 90° and that between the second and third is 120°. Find the ratio of the forces. 7.5

SECTION – B

4. Find the forces in all the members of the truss shown in fig. 1 : 15

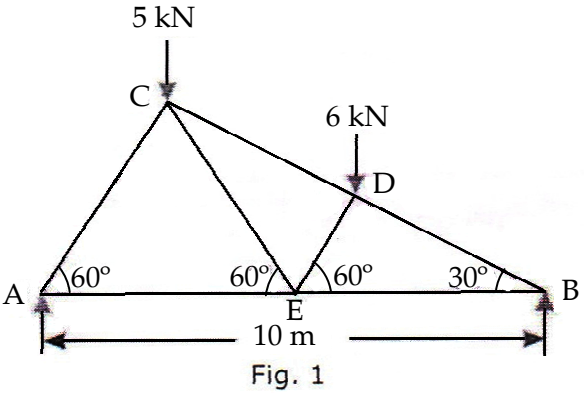

Fig. 1

5. Determine the center of gravity of the lamina shown in fig. 2 : 15

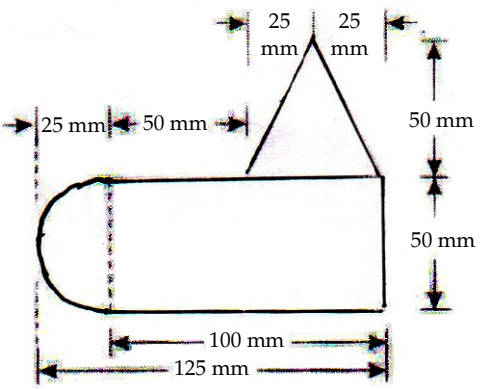

Fig. 2

SECTION – C

6. Determine the moment of inertia of a T section about the horizontal and vertical axis passing through the centre of gravity of the section having dimensions $10 \times 10 \times 2$ cm as shown in fig. 3. Also determine the polar moment of inertia. 15

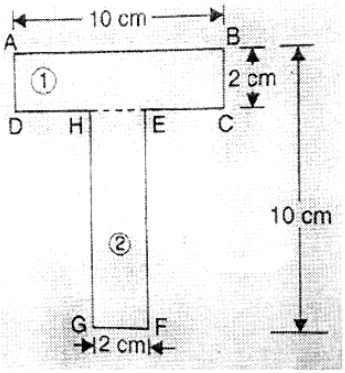

Fig 3

7. (a) Explain relative velocity and acceleration for a points on rigid body. 7.5

(b) Discuss Chasles' theorem in details. 7.5

SECTION – D

8. Draw the shear force and B.M. diagrams for a simply supported beam of length 8m carrying a uniformly distributed load of 10 kN/m for a distance of 4 m as shown in fig. 4 : 15

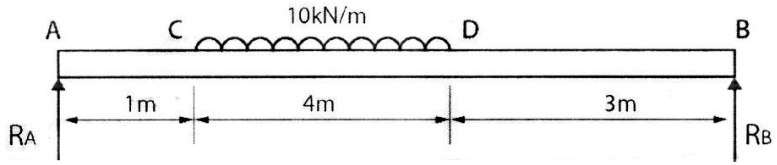

Fig 4

9. (a) Derive horizontal range and maximum height of a projectile. 7.5

(b) A car is moving at 15mm/sec when drivers puts on his brakes, thereby car skids n the direction of motion. Car weighs 500 kg and dynamic coefficient of friction is 0.6. How far will car moves before it stops ? 7.5