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Question Paper Code : 71387

B.Arch. DEGREE EXAMINATION, APRIL/MAY 2017.

Second Semester

AR 6201 — MECHANICS OF STRUCTURES — I

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State triangle law of forces.

2. Define Varignon's theorem.

3. What is meant by null member in a truss? How do you identify it?

4. Distinguish between determinate and indeterminate plane trusses.

5. State parallel axis theorem.

6. Define center of gravity.

7. Draw a typical stress-strain diagram for a mild steel and mark all salient point on it.

8. Define stress and strain.

9. Determine the value of bulk modulus for a material, if the modulus of elasticity of the material is 200 kN/mm^3 and the shear modulus is 95 kN/mm^2.

10. Write an expression relating modulus of elasticity, shear modulus and bulk modulus.

PART B — (5 × 16 = 80 marks)

11. (a) Five forces of magnitude 200 N, 150 N, 250 N, 100 N and 400 N are acting a point 'O'. (the first force acts towards the point while at the remaining forces acts away from the point). The angles made by 200 N, 150 N, 250 N, 100 N and 400 N forces with the positive X-axis are 30°, 90°, 130°, 160° and 270° respectively. Determine the magnitude and direction of the resultant force.

Or

(b) Find the magnitude and position of the resultant of the system of forces shown in Fig. Q.11(b).

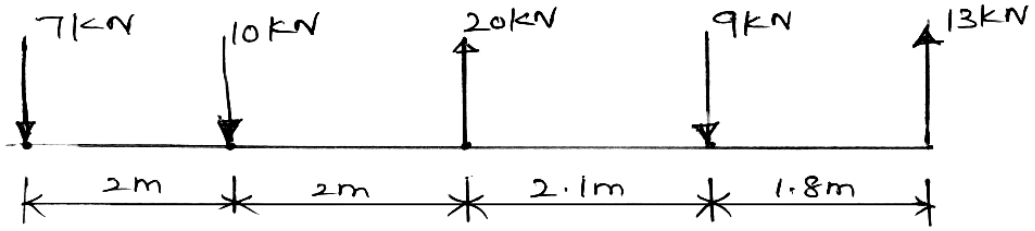

Fig. Q.11(b)

12. (a) Analyse the simply supported truss shown in Fig. Q.12(a) by method of joints.

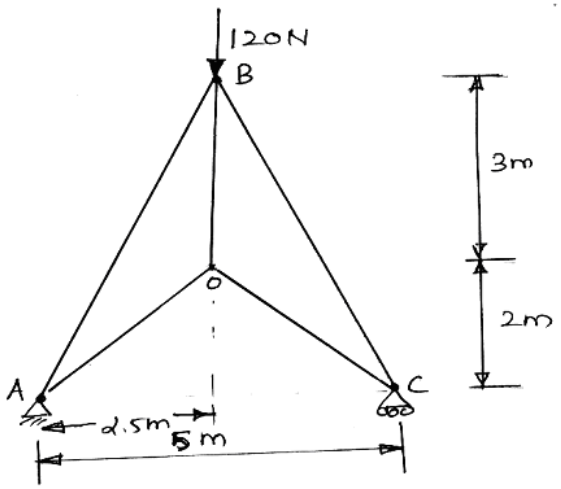

Fig. Q.12(a)

Or

(b) Determine the forces in all the members of a cantilever truss shown in Fig. Q 12(b) by method of joints.

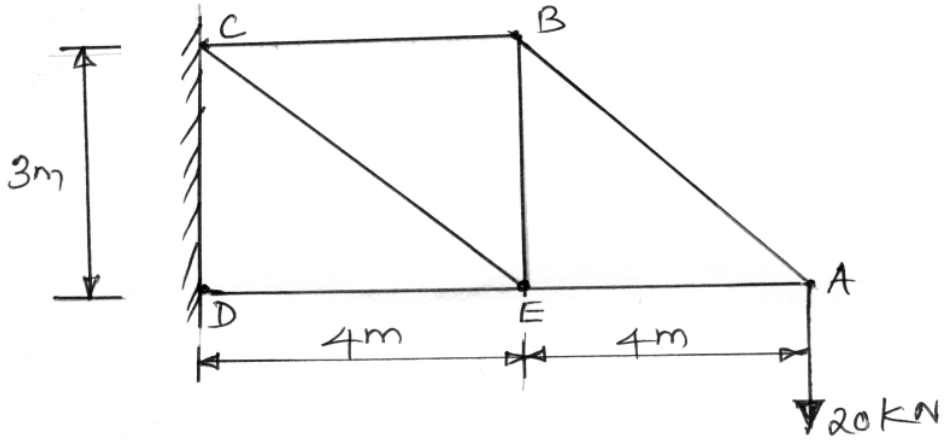

Fig. Q.12(b)

13. (a) Determine the moment of inertia of an angle section 200 mm × 100 mm × 8 mm (with longer leg vertical) about its centroidal axis.

Or

(b) Locate the centroid for the lamina shown in Fig. Q.13(b).

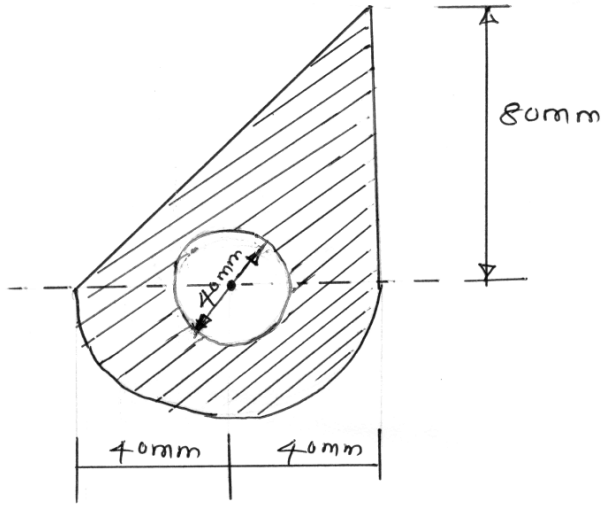

Fig. Q.13(b)

14. (a) Draw neat diagrams of stress-strain for mild steel, high tensile steel and concrete and explain its salient features.

Or

(b) A 600 mm long bar has rectangular cross section 50 mm × 60 mm. This bar is subjected to

(i) 100 kN tensile force on 500 mm × 60 mm faces

(ii) 200 kN compressive force on 50 mm × 600 mm faces, and

(iii) 250 kN tensile force on 60 mm × 600 mm faces.

Find the change in volume of the bar. Take modulus of elasticity as 2×10^5 N/mm^2 and Poisson's ratio as 0.30.

15. (a) Derive the relationship between modulus of elasticity, shear modulus and bulk modulus.

Or

(b) A steel bar 300 mm long, 50 mm wide and 10 mm is subjected to an axial pull of 100 kN. Find the change in length, width, thickness and volume of the bar. Take modulus of elasticity as 200 GPa and Poisson's ratio as 0.25.

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