Reg. No. : | | | | | | | | | | | | |

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).

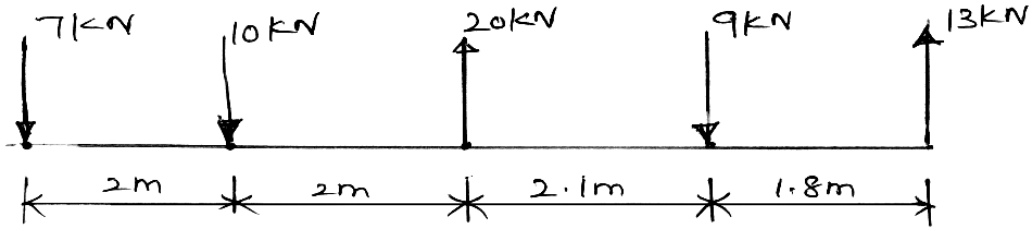

Fig. Q.11(b)

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

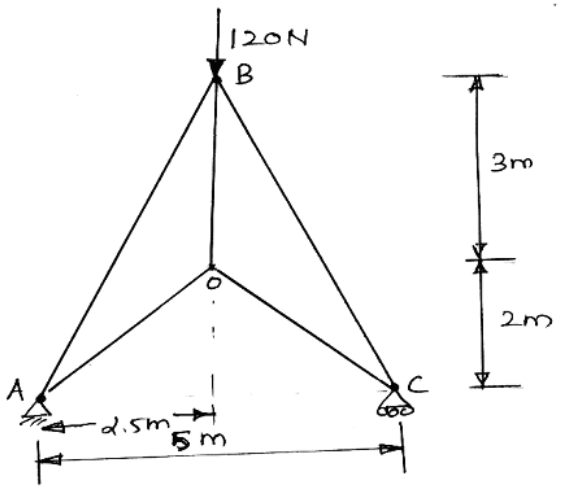

Fig. Q.12(a)

Or

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

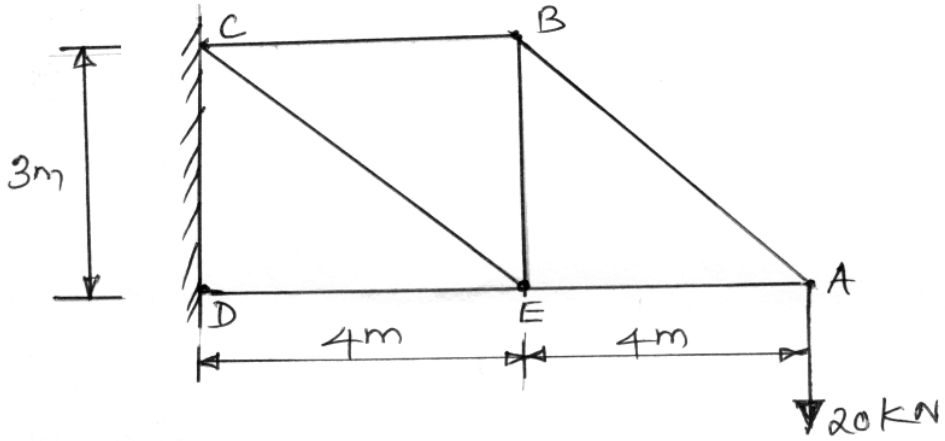

Fig. Q.12(b)

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).

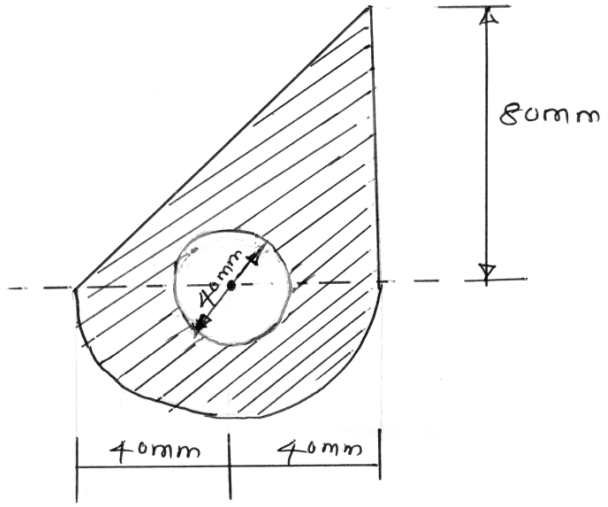

Fig. Q.13(b)

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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Reg. No. | | | | | | | | | | | | |

Question Paper Code : 77014

B.Arch. DEGREE EXAMINATION, APRIL/MAY 2015.

Second Semester

AR 6201 – MECHANICS OF STRUCTURES – I

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State: Lami's theorem.

2. How do you determine the resultant of a set of non-concurrent plane forces?

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

4. State the assumptions made in method of joints for determining the forces in the members of a plane truss.

5. Determine the radius of gyration of a rectangle of width 'b' and depth 'd' with respect to its centroidal axis parallel to the width.

6. What is polar moment of inertia of an area?

7. How do you determine the yield strength of high tensile steel?

8. How volumetric strain is related with linear strains?

9. What is meant by Poisson's ratio? Which material has higher value of Poisson's ratio?

10. Determine the value of bulk modulus for a material, if the modulus of elasticity of the material is 200 GPa and the shear modulus is 80 GPa.

PART B — (5 × 16 = 80 marks)

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

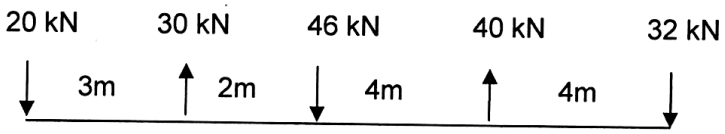
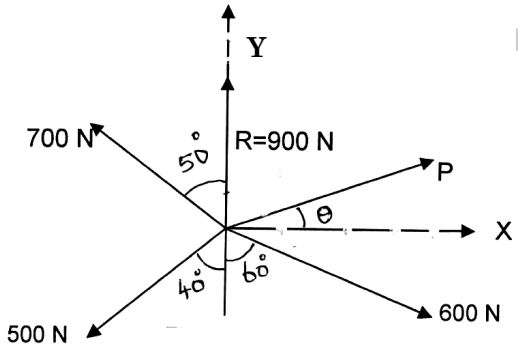


Fig.Q11(a)

Or

(b) The force system shown in Fig. Q 11 (b) has a resultant of 900 N pointing up along +ve Y axis. Find the value of P and θ required to give this resultant.



FigQ.11(b)

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

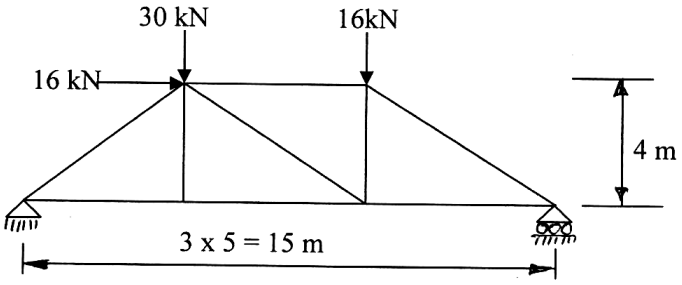


Fig.Q.12(a)

Or

(b) Analyze the cantilevered truss shown in Fig. Q.12(b) by method of joints.

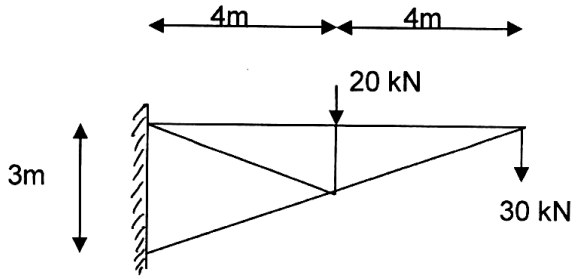


Fig.Q.12(b)

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

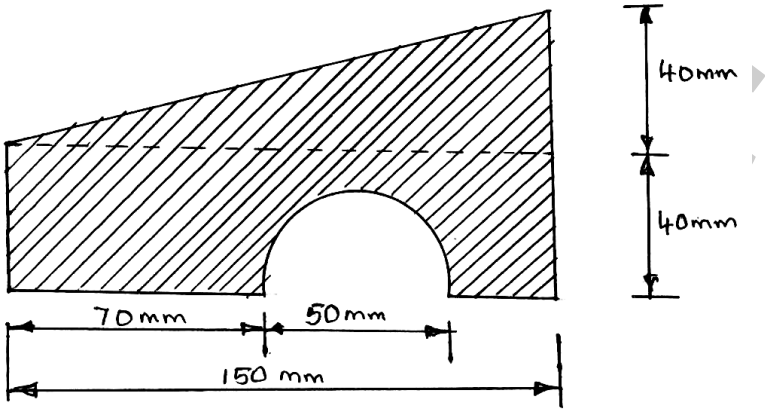


Fig.Q.13(a)

Or

(b) Determine the area moment of inertia (second moment of area) of an angle section 250 mm × 180 mm × 10 mm (with longer leg vertical) about its vertical and horizontal centroidal axes.

14. (a) A steel bar is 2.5 m in length and is subjected to an axial pull of 1200 kN. The bar is 30 mm in diameter for a length of 1.2 m, 25 mm in diameter for a length of 0.7 m and 20 mm in diameter for the remaining length. Find the total extension of the bar. Take modulus of Elasticity as 200 GPa.

Or

(b) A 500 mm long bar has rectangular cross section 50 mm × 60 mm. This bar is subjected to

(i) 50 kN tensile force on 50 mm × 60 mm faces

(ii) 150 kN compressive force on 50 mm x 500 mm faces, and

(iii) 250 kN tensile force on 60 mm x 500 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) An axial compressive load of 300 kN is applied to a metal bar of square section 50 mm × 50 mm. the contraction on a 200 mm gauge length is found to be 0.55 mm and the increase in thickness is 0.045 mm. Determine the modulus of Elasticity, shear modulus and Bulk modulus for the material.

Or

(b) (i) Derive the relationship between modulus of elasticity, shear modulus and Poisson's ratio. (8)

(ii) Derive the relationship between modulus of elasticity, bulk modulus and Poisson's ratio. (8)

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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80068

B.Arch. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

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. Two forces are acting at a point. If the angle between the resultant of magnitude 26.5 kN and one of the forces of magnitude 26.5 kN is 40°. Find the other force.

2. State the principle of moments.

3. When do you say a pin jointed plane truss is statically determinate?

4. List the assumptions made in the analysis of a perfect truss.

5. Define radius of gyration.

6. State the theorem of parallel axis.

7. What do you mean by Poisson's ratio?

8. Draw a typical stress-strain diagram for mild steel and mark all salient points.

9. Write an expression relating modulus of elasticity and shear modulus.

10. Determine the value of bulk modulus for a material if the modulus of elasticity of the material is 200 GPa and the shear modulus is 80 GPa.

PART B — (5 × 16 = 80 marks)

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

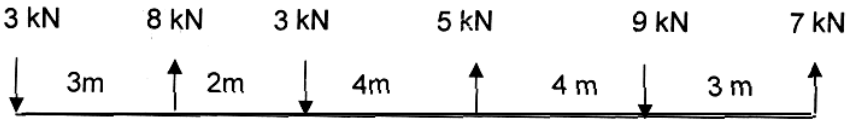
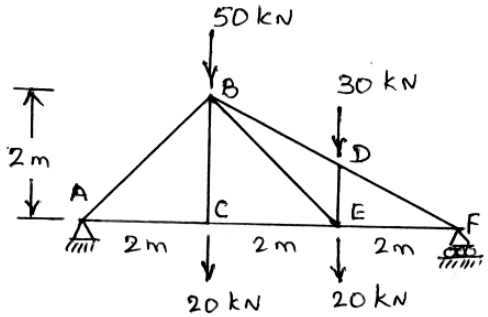


Fig.Q.11(a)

Or

(b) Five forces of magnitude 600 N, 450 N, 300 N, 200 N and 500 N are acting at a point 'O' (the direction of each-force is away from the point 'O'). The angles made by 600 N, 450 N, 300 N, 200 N and 500 N forces with the positive X-axis are 40°, 75°, 120°, 160° and 230° respectively. Determine the magnitude and direction of the resultant force.

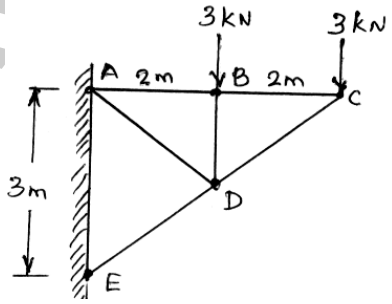
12. (a) Analyze the simply supported truss shown in Fig. Q.12(a) by method of joints and tabulate the member forces.



Fig, Q.12(a)

Or

(b) Analyze the cantilevered truss shown in Fig, Q.12(b) by method of joints and tabulate the member forces.



Fig, Q.12(b)

13. (a) Locate the centroid of the lamina shown in Fig. Q.13 (a)

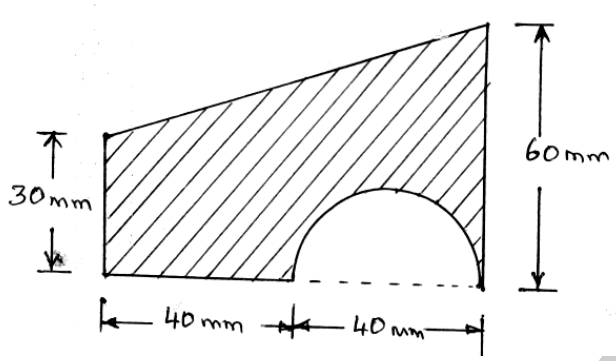


Fig. Q.13 (a)

Or

(b) Determine the moment of inertia about the vertical and horizontal centroidal axes of a symmetrical T section which is formed by two wooden planks of size 180 mm × 20 mm.

14. (a) A tapering circular rod has diameter d_1 at one end and it tapers uniformly to a diameter d_2 at the other end in a length 'L'. If the modulus of elasticity of the material is E, derive the expression for the change in length from first principle when it is subjected to an axial force 'P'.

Or

(b) A 600 mm long bar has rectangular cross section 40 mm × 50 mm. This; bar is subjected to : (i) 40 kN tensile force on 40 mm × 50 mm faces, (ii) 200 kN compressive force on 40 mm × 600 mm faces, and (iii) 300 kN tensile force on 50mm × 600 mm faces. Find the change in dimensions and volume of the bar.

Take modulus of Elasticity as 2×10^5 N/mm^2 and Poisson's ratio as 0.30.

15. (a) When a square bar of certain material (40 mm × 40 mm in section) is subjected to an axial pull of 160 kN, the measured extension on a gauge length of 200mm is 0.1 mm and the decrease in each side of the square is 0.005 mm. Calculate modulus of Elasticity, shear modulus and Bulk modulus for this material.

Or

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

Reg. No. | | | | | | | | | | | | |

Question Paper Code : 27028

B.Arch. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

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. Define triangle law of forces.
2. Define Varignon's theorem.
3. Name any two types of supports.
4. Differentiate determinate and indeterminate structures.
5. Define center of gravity.
6. Define Section modulus.
7. Define Stress and strain.
8. List out types of loads.
9. Define Hook's law.
10. Define Poisson's ratio.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain all the conditions of equilibrium.

(ii) What is a couple? Write down its characteristics.

(iii) Explain Bow's notation with an example.

Or

(b) (i) Define free body diagram and mention its influences.

(ii) Three forces of magnitude 40 kN, l5 kN and 20 kN are acting at a point O. The angles made by these forces with X-axis are 60°, 120° and 240° respectively. Determine the magnitude and direction of the resultant force.

12. (a) (i) What is a frame? Mention its classification.

(ii) Determine the forces in the various members of the truss shown in figure –1.

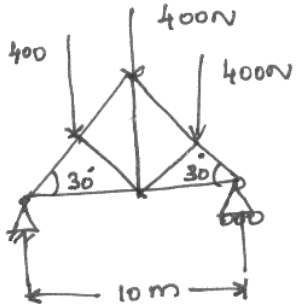


Figure – 1

Or

(b) Determine the forces in all the members of a cantilever truss shown in figure-2.

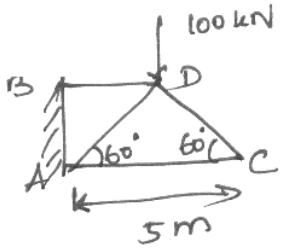


Figure – 2

13. (a) Derive an expression to the moment of inertia of a triangular section about an axis passing through the C.G of the section and parallel to the base.

Or

(b) Find the moment of inertia of the section shown in figure-3.

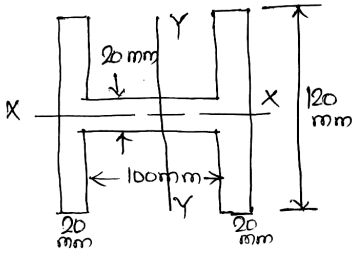


Figure – 3

14. (a) Establish the relationship between the three modulus of elasticity E,G and K.

Or

(b) A metal bar 30 mm in diameter was subjected to a tensile load of 54 kN and the measured extension on 300 mm gauge length was 0.112mm and change in diameter was 0.00366 mm. Calculate the Poisson's ratio and value of the three modulus.

15. (a) A surveyor's steel tape 30m long has a cross-sectional area 8mm^2 . A force of 60 N is axially applied on the tape. If the modulus of elasticity is 200 kN/mm^2, determine the elongation of the tape.

Or

(b) If the modulus of elasticity of a material is 200 GN/m^2 and modulus of rigidy is 80 GN/m^2 determine the Poisson's ratio and buck modulus.

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