**1101**

Code : 15AR31T

Register Number

III Semester Diploma Examination, Nov./Dec. 2018

# MECHANICS OF STRUCTURE

Time : 3 Hours ]

[ Max. Marks : 100

*Note :*   (i)   Answer any **six** questions from Part – **A**.

(ii)   Answer any **seven** questions from Part – **B**.

## PART – A

### (Answer any Six questions)

1.   State parallelogram law of force with related expression.   5

2.   Define polar moment of inertia and radius of gyration.   5

3.   Define coplanar concurrent and non-concurrent forces with supporting sketches.   5

4.   Define strain. List different types of strain.   5

5.   Define shear force and bending moment.   5

6.   Explain the various end conditions of columns and give their effective length as per Euler's theory.   5

7.   Explain points to be considered for determining the stress in composite section.   5

8.   What are elastic constant ? List different types of elastic constants.   5

9.   What is slenderness ratio ? How are columns are classified based on slenderness ratio ?   5

## PART – B

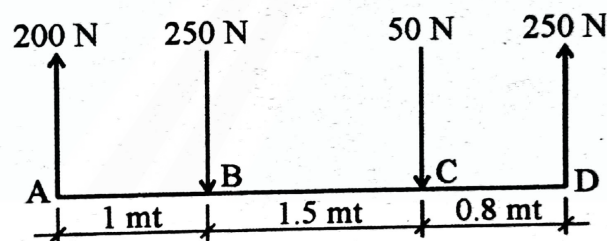### (Answer any Seven questions)

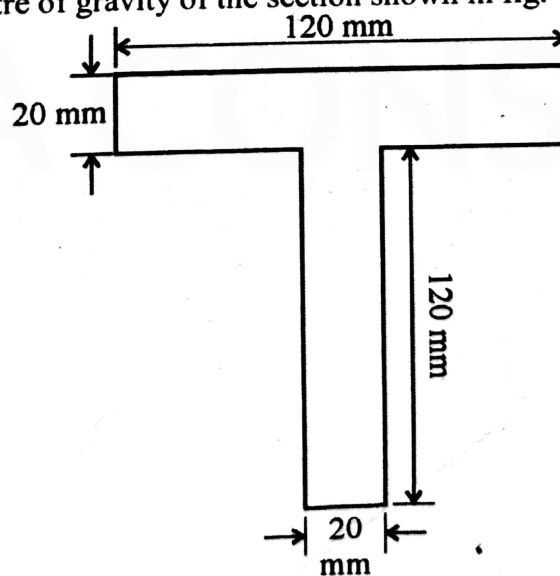10. Determine the resultant of coplanar concurrent forces shown in fig.    10
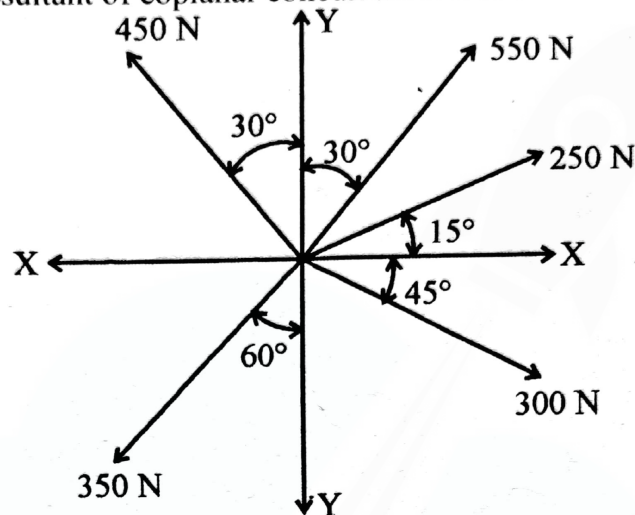


11. Four parallel forces of magnitude 200 N, 250 N, 50 N and 250 N are shown in fig. Determine magnitude of resultant and also the distance of the resultant from point A.    10
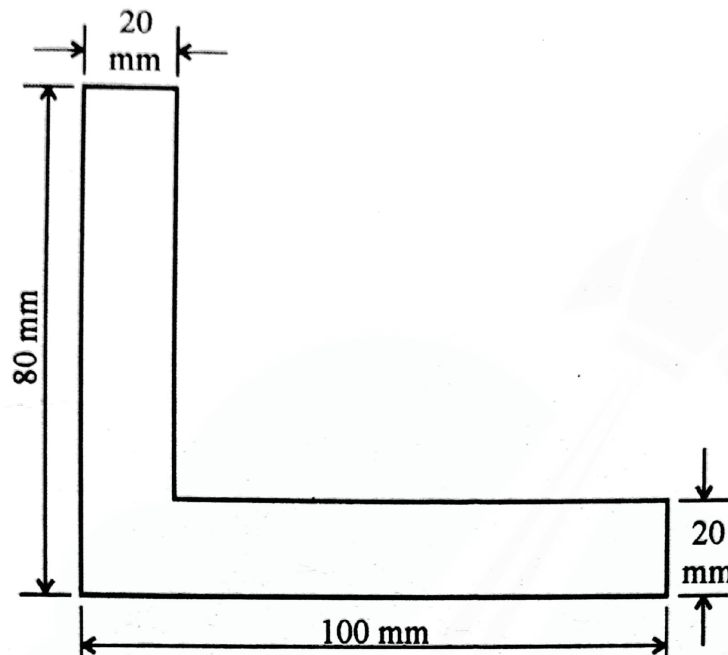


12. Determine the centre of gravity of the section shown in fig.    10

13. Find the moment of inertia about centroidal X-X and Y-Y axes of the angle section with measurements $100 \times 80 \times 20$ mm.    **10**



14. A steel rod 25 mm diameter and 4 mt long is subjected to an axial pull of 45 kN. Find :

    (i) Stress

    (ii) Strain

    (iii) Elongation

    Take $E = 2.1 \times 10^5$ N/mm$^2$.    **10**

15. A steel rod 20 mm diameter and 6 mt. long is connected to two grips one at each end at a temperature of 100°C. Determine the force exerted on the bar when the temperature falls to 20°C if :

    (i) grips do not yield

    (ii) grips yield by 1.2 mm

    Take $\alpha = 12 \times 10^{-6}$ / °C, $E = 2 \times 10^5$ N/mm$^2$    **10**

16. A bar 300 mm long and 50 mm square in section for 120 mm of its length, 25 mm diameter for middle 80 mm of its length and 40 mm in diameter for the remaining length if a tensile load of 100 kN is applied on the bar calculate the maximum and minimum stresses induced in it and total elongation.
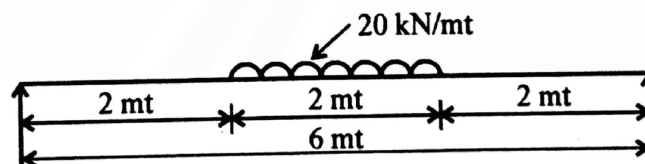
   Take $E = 2 \times 10^5$ N/mm$^2$. **10**

17. For the given beam shown in fig. calculate B.M. and S.F, and draw B.M.D. and S.F.D. **10**
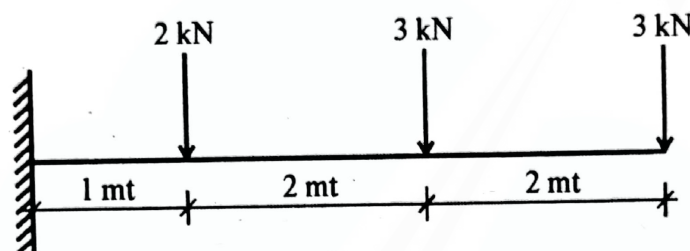


18. For the given beam shown in fig. calculate B.M. and S.F. and draw S.F.D. and B.M.D. **10**



19. A hollow section of external diameter 60 mm and thickness 5 mm and 2.5 mt. long is used as a column one end is fixed while the other end is hinged. Find the safe compressive load using Euler's formula.

   Take $E = 1 \times 10^5$ N/mm$^2$. Factor of safety – 3. **10**

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