**1274** **Code : 15ME31T**

*Register Number* | | | | | | | |

**III Semester Diploma Examination, Nov./Dec. 2017**

# STRENGTH OF MATERIALS (SOM)

**Time : 3 Hours ]** **[ Max. Marks : 100**

*Note :* (i) Answer any **six** questions from Part-A and any **7** questions from Part-B.

(ii) Assume missing data.

## PART – A

(Each Questions carries **5** marks)



1. Define Poisson's ratio and modulus of rigidity. **5**



2. Explain thermal stress and volumetric strain. **5**

3. State parallel and perpendicular axis theorem applied to moment of Inertia. **5**



4. Locate CG for triangle, semicircle, circle, square and cone with help of plain figure. **5**

5. Name the types of load acting on beams with illustration. **5**

6. Explain point of contra-flexure in a beam. **5**

7. Explain moment of resistance and modulus of Rupture. **5**

8. Explain modulus of sections for Hollow circular and Hollow rectangular section. **5**

9. Explain strain energy and resilience. **5**

## PART – B

(Each questions carries **10** marks)

10. A steel bar 50 mm wide, 12 mm thick, 300 mm long is subjected to an axial pull of 100 kN. Find change in length, width, thickness and volume of the bar. Take $E = 2 \times 10^5$ N/mm$^2$, Poisson's ratio = 0.32 **10**

11. A bar of 30 mm diameter is subjected to a pull of 60 kN. The measured extension on gauge length of 200 mm is 0.09 mm and the change in diameter is 0.0039 mm. Calculate the Poisson's ratio and the values of the Young's modulus, Rigidity modulus and Bulk modulus. **10**

12. (a) Calculate the centroid of the L-section shown in figure (i) **5**

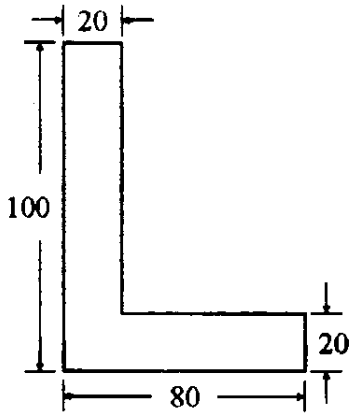


**Figure (i)**

**Note : All dimensions are in mm.**

(b) Calculate the centre of gravity of section shown in fig. (ii). **5**

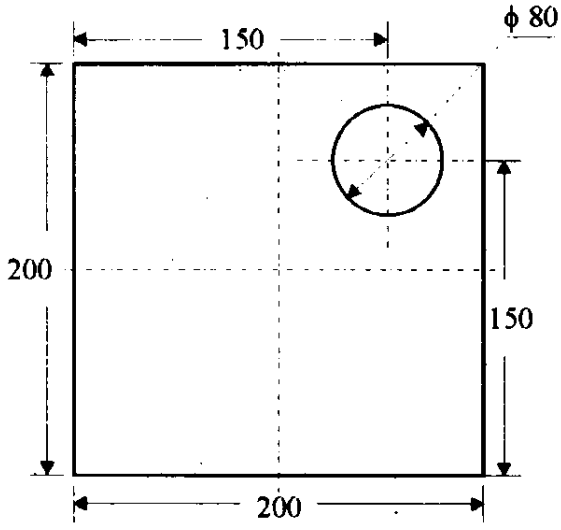


**Fig. (ii)**

**Note :All dimensions are in mm.**

13. Find the Moment of Inertia (MI) about horizontal and vertical centroidal axes ($I_{xx}$ & $I_{yy}$) of T section shown in fig. (iii) **10**

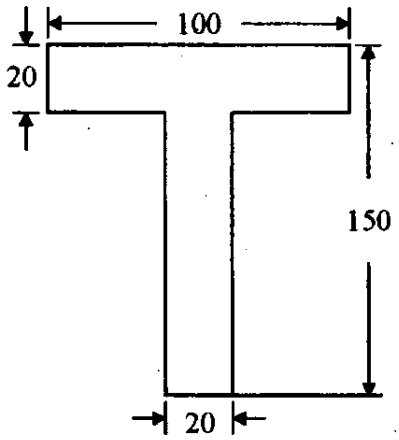


**Fig. (iii)**

**Note :All dimensions are in mm.**



14 A cantilever 5 metre long carries point loads of 30 kN and 10 kN at a distance of 1 metre and 5 metre from the fixed end. In addition to this the beam carries a UDL of 10 kN/m between the point loads. Draw the SFD and BMD. **10**



15. A simply supported beam 4 metre long is subjected to two point loads of 2 kN and 4 kN each at a distance of 1.5 metre and 3 metre from the left end. Draw SF and BM diagrams for the beam. **10**

16. A simply supported wooden beam of span 1.3 metre is carrying a central point load of 40 kN. If allowable bending stress in the timber is taken as $8N/mm^2$. Find the breadth and depth of the timber. Take b = 0.6 d. **10**

17. A beam is simply supported and carries a uniformly distributed load of 40 kN/m run over the whole span. The section of the beam is rectangular having depth as 500 mm. If the maximum stress in the material of the beam is 120 $N/mm^2$ and moment of Inertia of section is $7 \times 10^8$ $mm^4$. Find the span of the beam. **10**

18. (a) Compare the strength of Hollow and solid shaft. **5**

(b) Calculate the strain energy stored in a bar 2.5 metre long, 50 mm wide and 40 mm thick when it is subjected to a tensile load of 50 kN. Take Young's modulus is $2 \times 10^5$ N/mm$^2$. **5**

19. A solid circular shaft is required to transmit 120 kW at 180 rpm. The permissible shear stress in the shaft is 70 N/mm$^2$. The maximum torque transmitted exceeds the mean torque by 30% more than mean torque. Find the suitable diameter of the shaft. Also find the angle of twist in a length of 2 metre. The value of rigidity modulus is $0.9 \times 10^5$ N/mm$^2$. **10**