1050

Code : 15CE31T

Register Number | | | | | | | |

III Semester Diploma Examination, Nov./Dec. 2017

ENGINEERING MECHANICS & STRENGTH OF MATERIALS

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

PART – A

Note : (i) Answer any **six** questions.
(ii) Each question carries **five** marks.

1. Define resultant force. What are the characteristics of force ? **5**

2. Define : **5**
   (a) Malleability
   (b) Fatigue
   (c) Ductility
   (d) Brittleness
   (e) Hardness

3. State parallel axis theorem and perpendicular axis theorem. **5**

4. Name the different types of beams with neat sketch. **5**

5. Show that a simply supported beam has maximum Shear Force (S.F.) is $\frac{WL}{2}$ and maximum Bending Moment (B.M.) is $\frac{WL^2}{8}$. **5**

6. List the assumptions made in theory of simple bending. **5**

7. Define : **5**
   (a) Neutral Axis
   (b) Moment of Resistance
   (c) Section Modulus

   Write an equation of section modulus for rectangular and circular section.

8. State moment area method. 5

9. Define effective length. Tabulate the effective length and crippling load of column for various end conditions. 5

PART – B

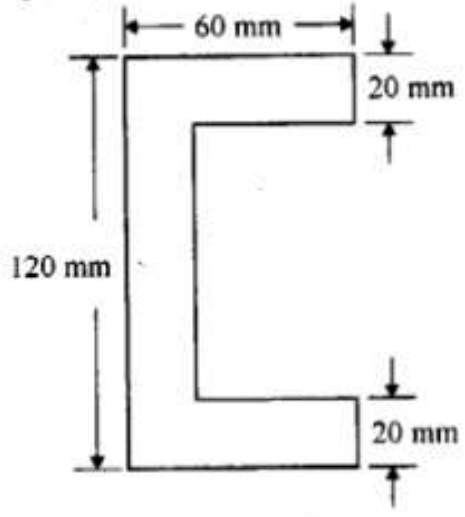
Note : (i) Answer any seven questions.
(ii) Each question carries ten marks.

10. A bar of 20 mm diameter is tested in tension. It is observed that when a load of 37.7 kN is applied, the extension is measured over a gauge length of 200 mm is 0.12 mm and contraction in diameter is 0.0036 mm. Calculate the Poisson's ratio and elastic constants. 10

11. The following forces act at a point : 10
(a) 25 N inclined at 25° towards North of East
(b) 30 N towards North
(c) 32 N towards North West
(d) 45 N inclined at 40° towards South of West
Calculate the magnitude and direction of the resultant force for the above system of forces.

12. (a) Draw stress-strain diagram for mild steel and explain. 5
(b) A hollow steel column of external diameter 250 mm has to support an axial load of 2000 kN. If the ultimate stress for the steel column is 480 N/mm^2. Calculate the internal diameter of the column allowing a load factor of 4. 5

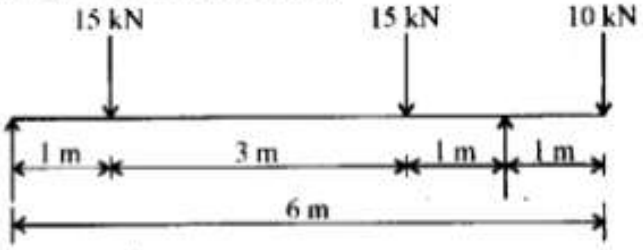
13. Calculate the centre of gravity of channel section as shown in fig. 10



14. Calculate the MI of an unequal angle section about the centroidal X-X and Y-Y axes. The longer leg is 100 mm × 20 mm and shorter leg is 80 mm × 20 mm. the longer leg kept vertical. **10**

15. A cantilever beam 6 metres length is subjected to a UDL of 4 kN/m for 5 metres from the fixed end. It also carries a point load of 7 kN at a distance of 3 metres from fixed end and another point load of 6 kN at free end. Draw S.F.D. and B.M.D. **10**

16. Draw B.M.D. and S.F.D. for the beam shown in the figure and mark the salient points. Locate the point of contraflexture. **10**



17. A "T" shaped cross-section of a beam having flange 200 mm × 50 mm and a web 200 mm × 50 mm with overall height 250 mm is subjected to vertical shear force of 100 kN. Calculate the shear stress at important points and draw shear stress distribution diagram. $I = 113.4 \times 10^6$ mm^4. **10**

18. (a) A simply supported beam of span "*l*" carrying a point load "W" at mid span. Determine the slope and deflection. **5**

(b) A simply supported beam of 2 m span carries a point load of 20 kN at its mid point. Determine the slope and deflection of the beam.

Take EI = 500×10^9 N.mm^2. **5**

19. A hollow alloy tube 4 m long with external and internal diameters of 40 mm and 25 mm respectively was found to extend 4.8 mm under a tensile load of 60 kN. Calculate the Euler's Buckling load for the tube with both ends hinged. Also calculate the safe load on the tube, taking factor of safety as 5. **10**