1005

Code : 15CE31T

Register Number | | | | | | | | | | |

III Semester Diploma Examination, April/May-2019

ENGINEERING MECHANICS & STRENGTH OF MATERIALS

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

Instructions : (I) Answer any six questions from PART – A.

(II) Answer any seven questions from PART – B.

PART – A

1. State conditions of equilibrium. 5

2. Define : 5

   (a) Percentage Elongation.

   (b) Percentage Reduction in Area.

   (c) Hooke's Law.

   (d) Factor of Safety.

   (e) Coefficient of thermal expansion.

3. (a) List two differences between centre of gravity and centroid. 2

   (b) State parallel axis theorem. 3

4. Name different types of transverse loads subjected by beams, with neat sketch. 5

5. Show that a simply supported beam subjected to point load 'W' at mid span has maximum shear force is $\frac{W}{2}$ and Maximum Bending Moment $\frac{WL}{4}$. 5

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6. Define : 5

(a) Simple Bending theory

(b) Neutral Axis

(c) Section Modulus

(d) Flexural Rigidity

(e) Sagging Moment

7. Derive the expression for section modulus with neat sketch. 5

(a) Hollow rectangular sections with symmetrically placed opening.

OR

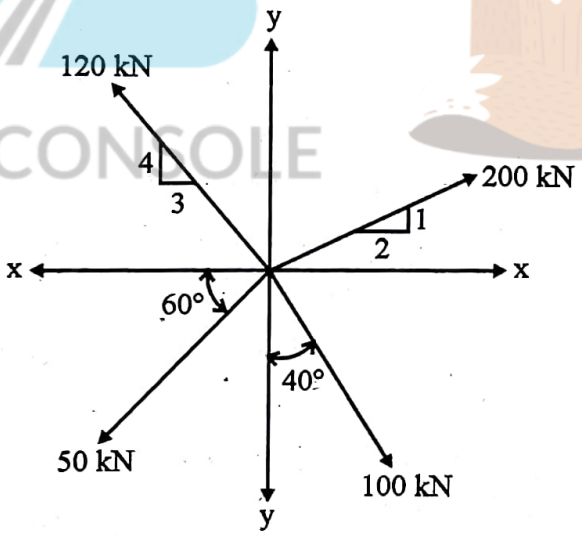
(b) Circular section.

8. A cantilever beam of span 't' carrying a uniformly distributed load over entire span. Determine the slope and deflection by moment area method. 5

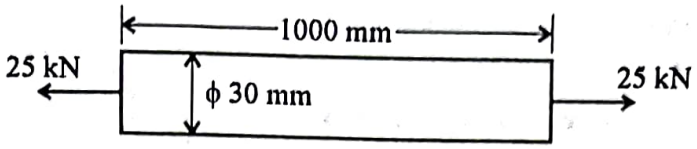
9. List the assumptions mode in Euler's Column theory. 5

PART – B

10. A system of four forces acting on a body is as shown in fig. Determine the resultant. 10



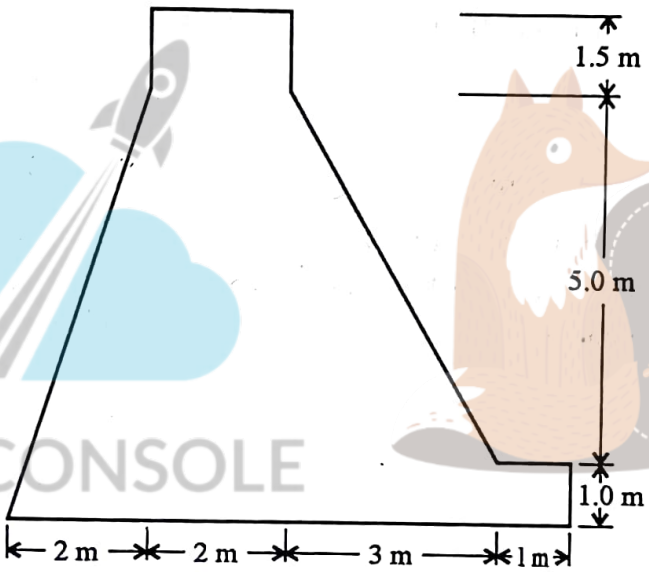
11. (a) A bar of length 1000 mm & diameter 30 mm is under a load of 25 kN, if the extension of the bar is 0.185 mm. What is the modulus of elasticity of the bar ? **5**



(b) A bar of length 500 mm and diameter 12 mm is subjected to a load of 10 kN. Determine the strain energy stored in it. Take $E = 2.1 \times 10^5$ N/mm^2. **5**

12. A circular rod of 100 mm diameter and 500 mm long is subjected to a tensile force of 1000 kN. Determine modulus of rigidity, bulk modulus and change in volume if Poisson's ratio is 0.3 & $E = 2 \times 10^5$ N/mm^2. **10**

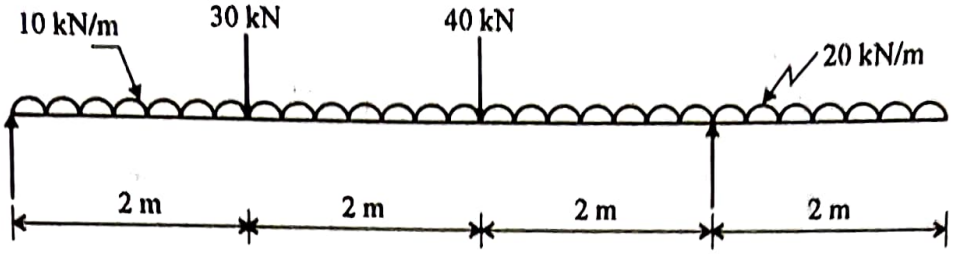
13. Determine the centroid of the irregular section. **10**



14. I section consists of top flange 100 mm × 20 mm, bottom flange 200 mm × 20 mm and overall depth 140 mm and web thickness of 20 mm of the section. Determine the moment of inertia about an axis passing through it's centroidal x-x and y-y axis. **10**

15. A cantilever beam 2m span carries two point loads of 10 kN & 30 kN at it's free end and 1.5 m from free end, it also carries an UDL of 20 kN/m over a span of 1 m from 30 kN load towards free end. Draw B.M.D & S.F.D. **10**

16. Draw B.M.D. & S.F.D. for the beam shown in the figure and mark the salient points and locate the point of contra flexure. **10**



17. A circular pipe of external diameter 70 mm and thickness 8 mm is used as a simply supported beam over an effective span 2.5 m. Find the maximum UDL it can carry, if the permissible stress in tube is 200 N/mm^2. **10**

18. A simply supported beam 4 m long carrying UDL of 40 kN/m over entire span. Find the deflection at centre of beam. If the slope at the ends of the beam not to exceed one degree. **10**

19. A I section has moment of inertia about $I_{xx} = 992.5 \times 10^6$ mm^4 and $I_{yy} = 225.6 \times 10^6$ mm^4. It is used as a beam with simply supported ends and it deflects by 5 mm. When subjected to a point load of 100 kN at mid span. Find the safe load if this I-section is used as a column with both ends fixed. Use Factor of safety '4' and take E $= 2 \times 10^5$ N/mm^2. **10**