CBCS Scheme

USN | | | | | | | | | | |

15CV/CT32

Third Semester B.E. Degree Examination, June/July 2018
Strength of Materials

Time: 3 hrs. Max. Marks: 80

Note: *1.* **Answer any FIVE full questions, choosing ONE full question from each module.**
2. Missing data, if any, may be suitably assumed.

Module-1

1 a. For a bar of uniform section derive an expression for elongation due to self weight. **(06 Marks)**

b. Evaluate the deformation of the bar, given, $E_1 = E_2 = E_3 = 200GPa$, refer Fig.Q1(b). **(10 Marks)**

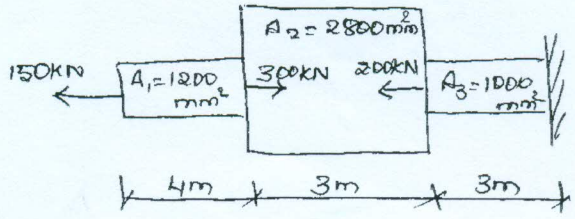

Fig.Q1(b)

OR

2 a. Derive an expression between Young's modulus, Modulus of rigidity and Poisson's ratio. **(10 Marks)**

b. A circular rod of dia 200mm and 500mm long is subjected to a tensile force of 45kN modulus of elasticity = 200 kN/mm^2, Find stress, strain and elongation of bar due to applied load. **(06 Marks)**

Module-2

3 At a certain point in a stressed body, the principal stresses are σ_x = 80 MPa and σ_y = –40MPa. Determine σ and τ on the planes whose normal's are at +30° and +120° with x – axis. **(16 Marks)**

OR

4 a. Derive an expression of tangential stress and longitudinal stress of thin walled pressure vessels. **(08 Marks)**

b. A rectangular block of material is subjected to a tensile stress of 100N/mm^2 on one plane and a tensile stress of 50N/mm^2 on a plane at right angles together with shear stress of 60 N/mm^2 on same planes, find : i) direction of the principal plane ii) magnitude of the principal plane iii) magnitude of greatest shear stress. **(08 Marks)**

Module-3

5 a. Define : i) bending moment ii) shear force iii) shear force diagram iv) bending moment diagram. **(08 Marks)**

b. Draw SFD and BMD for the cantilever beam shown in Fig.Q5(b). **(08 Marks)**

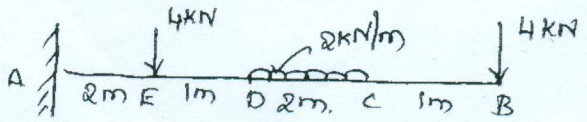

Fig.Q5(b)

OR

6 a. Derive the relation between load intensity, bending moment and shear force. **(06 Marks)**

b. A beam ABC, 8m long has supplied at A and B, it is long between A and B. The beam carries an udl of 10kN/m between A and B. At free end point C, a point load of 15 kN acts. Draw BMD and locate point of contra-flexure, if any. **(10 Marks)**

Module-4

7 a. Explain pure bending with an suitable example and mention the assumptions of pure bending. **(06 Marks)**

b. A cast iron beam section shown in Fig.Q7(b) is freely supported on a span of 5m. IF the tensile stress is not to exceed 20 N/mm^2. Find the safe UDL which the beam can carry. Find also the maximum compressive stress. **(10 Marks)**

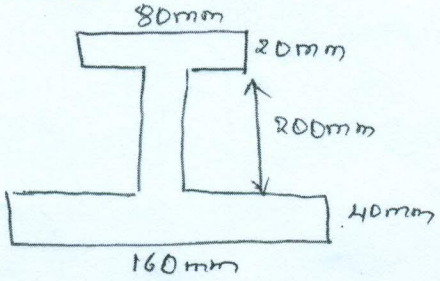

Fig.Q7(b)

OR

8 a. Derive an Euler's crippling load when both ends of the column are pinned. **(08 Marks)**

b. A hollow cylindrical cost iron column is 4m long both ends being fixed. Design the column to carry a axial load of 250 kN. Use Rankine's formula and factor of safety = 5. The internal diameter may be taken as 0.80 time the external diameter. Take E_C = 550 N/mm^2 and $\alpha = \frac{1}{1600}$. **(08 Marks)**

Module-5

9 a. Derive torsional equation for circular shaft. **(08 Marks)**

b. A steel shaft transmits 105kN at 160 rpm. If the shaft is 100mm in diameter. Find the torque on the shaft and the maximum sharing stress induced. **(08 Marks)**

OR

10 a. Define pure torsion, polar modulus and torsional rigidity. **(06 Marks)**

b. A solid shaft is subjected to a torque of 15 kN-m. Find the necessary diameter of the shaft if the allowable shearing stress is 60N/mm^2 and the allowable twist is 1 degree in a length of 20 diameters of the shaft. Take C = 8 × 10^4 N/mm^2. **(10 Marks)**

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