CBCS SCHEME

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

17MR34

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Mechanics of Materials

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Determine total elongation in an uniformly tapering rectangular section bar of width 'a' at one end to 'b' at the other end. **(10 Marks)**

b. Determine the stresses in various segments of the circular bar shown in Fig.Q1(b). Complete the total elongation taking Young's modulus to be 195Gpa. **(10 Marks)**

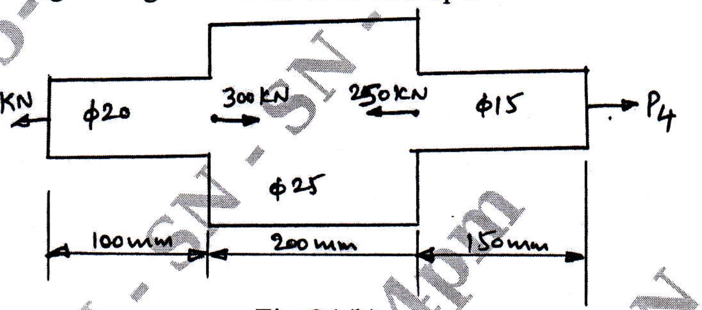

Fig.Q1(b)

OR

2 a. Define volumetric strain. Derive a expression for volumetric strain of a rectangular bar subjected to single direct load. **(10 Marks)**

b. Derive relation between modulus of elasticity and bulk modulus. **(10 Marks)**

Module-2

3 a. Define principal stresses and principal planes. **(04 Marks)**

b. Derive normal and tangential stresses to member subjected to two perpendicular normal stresses accompanied with state of simple shear. **(16 Marks)**

OR

4 a. The principal stresses at a point in a bar are 200Mpa (tensile) and 100Mpa (compressive). Determine the resultant stresses in magnitude and direction on a plane inclined at 60° to the axis of major principal stress. Also determine the maximum intensity of shear stress in the material at the point. **(10 Marks)**

b. Derive Lame's equation in thick cylinders. **(10 Marks)**

Module-3

5 a. Derive relation between loads, shear force and bending moments. **(08 Marks)**

b. Draw SFD and BMD for a simply supported beam carrying an uniformly distributed load of w/unit length over entire span. **(12 Marks)**

OR

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

6 a. Write a sign conventions for shear force and bending moment. (04 Marks)
b. Draw SFD and BMD for the beam shown in Fig.Q6(b). (16 Marks)

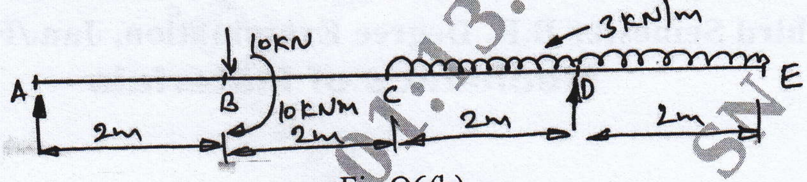

Fig.Q6(b)

Module-4

7 a. What are the assumptions made in pure bending. (05 Marks)
b. Derive expressions for shear stress distribution in I-Section beam. (15 Marks)

OR

8 a. Derive a relation between slope, deflection and radius of curvature. (10 Marks)
b. Derive a bending equation. (10 Marks)

Module-5

9 a. Derive a relation between torque and shear stress in a hollow circular shaft. (12 Marks)
b. A Solid circular shaft has 40mm diameter. When a twisting moment of 1KNM is applied, determine the shear stress induced at the centre, at a point 10mm from the centre and at the outer surface. Also draw the sketch showing the distribution of shear stress. (08 Marks)

OR

10 a. Derive expression for a Euler's crippling load for a column when both of its ends are hinged. (10 Marks)
b. A column of timber section is 200mm×300mm and 5m long. One end of the column is fixed and the other end is free. If the Young's modulus of timber is 17.5 KN/mm^2 determine i) crippling load ii) Safer load if the factor of safety is 2.5. (10 Marks)

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