Roll No ....

CE-3003-CBGS
B.E., III Semester
Examination, December 2020
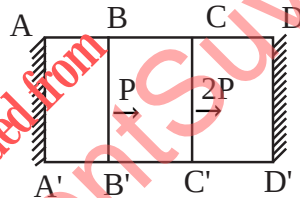## Choice Based Grading System (CBGS)
Strength of Materials

Time : Three Hours

Maximum Marks : 70

Note: i)   Attempt any five questions.

     ii)   All questions carry equal marks.

     iii)   Assume any data suitably.

1. a)   A mild steel specimen is fixed at both the end as shown in fig. if load, P=30 kN and area = 5 cm² is given. Find the maximum stress induced in the specimen.   7
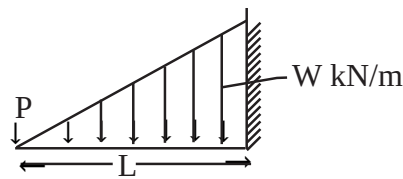

   b)   Explain in detail.

     i)   Plain Stress condition

     ii)   Plain strain condition   7

2. a)   A rectangular beam 300 mm deep is simply supported over a span of 4 meters. What uniformly distributed load the beam may carry, if the bending stress is not exceed 120 MPa. Take $I = 9 \times 10^6$ mm⁴.   7

   b)   Show that for a rectangular section, the distribution of shearing stress is parabolic.   7

3. Determine the deflection at free and of beam of constant uniform cross-section of length L. It is subjected to a concentrated load P at the free end with uniformly varying load in the full span of the beam as shown below. Also find out the slope at the free end by using STRAIN ENERGY.   14

4. a) A T-Section 150 mm×120 mm×20mm is used as a strict of 4 m long with hinged at its both ends. Calculate the crippling load if modulus of elasticity for the material be $2.0×10^5$ N/mm^2.   7

   b) State the Euler's assumption in column theory and also explain the middle third rule.   7

5. a) A Solid steel shaft is to transmit a torque of 10 kN-m. If the shearing stress is not to exceed 45 MPa, find the minimum diameter of shaft.   7

   b) Derive an expression for the angle of twist in the case of a member of circular cross-section subjected to torsional moment.   7

6. a) Explain the principle of super position.   7

   b) Calculate the strain energy stored in a bar of 2 m long, 5-mm wide and 40 mm thick when it is subjected to a tensile load of 60 kN. Take E = 200 GPa   7

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7. a) A I-section, with rectangular ends, has following dimensions:

   Flanges = 150 mm × 20 mm

   Web = 300 mm ×10 mm.

   Find the maximum shearing stress developed in the beam for a shear force of 50 kW.   7

   b) A cantilever beam 2 m long is subjected to uniformly distributed load of 5 kN/m over its entire length. Find the slope and deflection of the cantilever beam at it free end Take EI = 2.5×10^2 N mm^2.   7

8. Write short notes on: 14

   a) Relationship between modulus of elasticity, modulus of rigidity and Poisson's Ratio

   b) Longitudinal and lateral strain

   c) Stability

   d) Factor of safety

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