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DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

End Semester Supplementary Examination – Dec. 2019

Course: B. Tech in Chemical Engineering

Sem: IV

Subject Name: Strength of Materials (BTCHC404)

Marks: 60

Date: 02/12/2019

Duration:- 3 Hr.

Instructions to the Students:

1. Each question carries 12 marks.
2. Answer any five questions
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly.

Marks

Q. 1 Solve the following.

(A) A cantilever beam AB, 2m long carries uniformly distributed load of 1.5 kN/m over a length of 1.6 m from the free end. Draw the shear force and bending moment diagrams for the beam.

06

(B) A hollow cylinder 2 m long has outside and inside diameters of 50 mm and 30 mm respectively. Find the stress and deformation of cylinder, when it is carrying an axial tensile load of 25 kN. Take $E=100$ GPa.

06

Q.2 Solve the following.

(A) Explain Modulus of rigidity and types of stresses.

04

(B) A 1.5 m long column has a circular cross section of 50 mm diameter. One end of column is fixed in direction and position and the other end is free. Taking a factor of safety of 3, calculate the safe load using

08

i) Rankine's formula : Take $f_c=560$ N/mm², $\alpha=1/1600$

ii) Euler's formula : Young's modulus for cast iron = 1.2×10^5 N/mm²

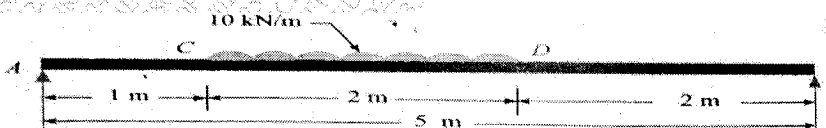
Q.3 Solve ANY TWO of the following.

(A) Explain Macaulay's method for slope and deflection of simply supported beam with an eccentric point load.

06

(B) A simply supported beam 5m long is loaded with a uniformly distributed load of 10 kN/m over a length of 2m as shown in fig. Draw the shear force and bending moment diagram for the beam.

06



(C) A brass rod 2m long is fixed at both its ends. If the thermal stress is not to exceed 76.5 MPa, calculate the temperature through which the rod should be heated. Take value of α and E as 17×10^{-6} /K and 90 GPa respectively.

06

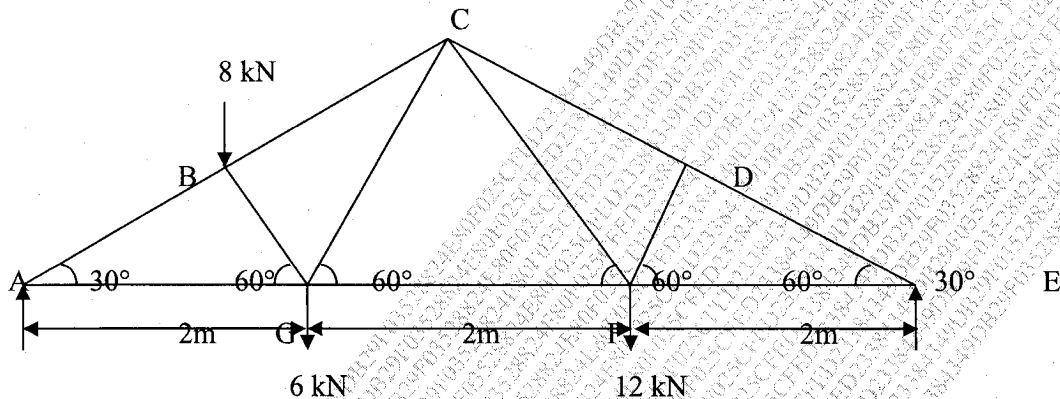
Q. 4 Solve the following.

- (A) A steam boiler of 800 mm diameter is made up of 10 mm thick plates. If the boiler is subjected to an internal pressure of 2.5 MPa, find the circumferential and longitudinal stresses induced in the boiler plates. 06

- (B) A steel rod 5m long and of 40 mm diameter is used as a column, with one end fixed and the other free. Determine the crippling load by Euler's formula. Take E as 200 GPa 06

Q.5 Solve the following.

- (A) An inclined truss shown in fig. is loaded as shown. Determine the nature & magnitude of the forces in the members BC, GC and GF of the truss. 08



- (B) Which analytical methods are used for finding out forces in the members of perfect frame? Explain any one in detail. 04

Q.6 Solve the following.

- (A) A cylindrical vessel 2 m long and 500 mm in diameter with 10 mm thick plates is subjected to an internal pressure of 3 MPa. Calculate the change in volume of the vessel. Take $E=200$ GP and Poisson's ratio $=0.3$ for the vessel material. 06

- (B) A spherical shell of 2 m diameter is made up of 10 mm thick plates. Calculate the change in diameter and volume of the shell, when it is subjected to an internal pressure of 1.6 MPa. Take $E=200$ GPa and $(1/m)=0.3$ 06

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