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Roll No. | | | | | | | | |

B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL/MAY 2019

MATERIAL SCIENCE AND ENGINEERING (CBCS) -(R 2015)

II Semester

CE7251 Strength of Materials

Time : 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. Draw qualitative stress strain curve for a brittle material.
2. Derive the relationship between Young's Modulus and Shear Modulus.
3. Draw SFD for a 6 m cantilever beam with central clockwise moment 2 kN.m.
4. Draw qualitative shear distribution for an I section due to shear force.
5. Write down the two equations required for solving the shafts fixed at both ends.
6. What is meant by spring constant of a spring?
7. For a beam if y is deflection, What is d^3y / dx^3?
8. Draw a conjugate beam for a 3 m cantilever beam having 2 kN point load at mid span.
9. What are the possible failure modes of a thin cylinder due to internal fluid pressure?
10. Write down Lame's equations.

PART– B (5 x 13 = 65 marks)

11. a) A bar is shown in Fig Q11a. Find value of P for equilibrium. Also determine the elongation, if Young's modulus E= $2x10^5$ N/mm^2 .The cross sectional area of each portion is given above the respective portions.

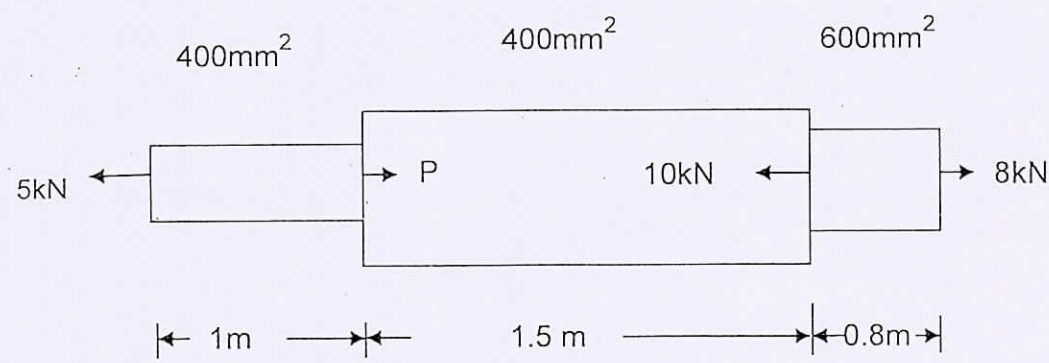

Fig Q11a

OR

b) A rectangular block 300 mm X 30 mm X 20 mm is subjected to 30 kN tensile force on 30 mm x 20 mm faces ,100 kN compressive force on 20 mm x 300 mm faces and 200 kN tensile force on 30 mm x 300 mm faces. Find the change in volume , assuming Poisson's ratio 0.3 and Young's modulus E= $2x10^5$ N/mm^2 .

12. a) A 6 m simply supported beam ACDEB, AC=CD=DE=EB=1.5 m, supported at A and B, is subjected to a concentrated load of 2 kN at C, another concentrated load of 5 kN at E, uniformly distributed load on the span AC with intensity 2 kN/m and another uniformly distributed load on the span DB with intensity 3 kN/m. Draw SFD and BMD for the beam.

OR

b) An I-shaped cross section of a beam is having the dimensions as follows: top and bottom flanges width 200 mm, thickness 20 mm, depth of web 310 mm and thickness of the web 10 mm. If it is subjected to a shear force of 100 kN, sketch the shear stress distribution.

13. a) A solid circular shaft transmits 70 kW at 150 rpm. Calculate the shaft diameter if the twist is not to exceed 1° in 2 m length. The shear stress is not to exceed 100 N/mm^2 .C=$100x10^9$ N/m^2.

OR

b) A close coiled helical spring is made up of 5mm diameter wires having 12 coils with 30 mm mean diameter. If the spring is subjected to an axial load of 100 N. Find the deflection of the spring, maximum shearing stress and maximum bending stress. Take C=80 GPa.and E= $2x10^5$ N/mm^2.

14 a) A 5 m cantilever beam DCBA is fixed at D and free at A. DC = 2 m, CB =1 m, BA = 2 m .The beam carries a point load of 10 kN at A, another point load of 20 kN at B and Uniformly distributed load on the span DC with intensity 4 kN/m. Determine Slope and deflection at A. Given E = 200 kN/mm^2 and I = $40x10^6$ mm^4. Use Macaulay's Method.

OR

b) A simply supported beam carries UDL throughout the span .Derive equations for slope at the supports and maximum deflection of the beam. Use Moment area Method.

15. a) A thin cylindrical vessel 1000 mm internal diameter, 10 mm metal thickness and 3 m long is subjected to an internal pressure of 3 N/mm^2.Find the changes in diameter, length and volume of the shell. Assume E=$2.1x10^5$ N/mm^2 and Poisson's ratio 0.3.

OR

b) Calculate the thickness of metal necessary for a cylindrical shell of internal diameter 120 mm to withstand an internal pressure of 45 N/mm^2, if the maximum permissible tensile stress is 120 N/mm^2.

PART– C (1 x 15 = 15 marks)

16 A 4 m simply supported beam ACB, (AC = CB = 2 m), is supported at A and B. The moments of inertia of the section of the left portion AC is $1x10^8$ mm^4 and that of the right portion CB is $2x10^8$ mm^4. The beam carries a point load of 100 kN at C. calculate the slope at A and B and deflection at C. Take uniform E as 200 GN/m^2.