Reg. No.										

B.Tech. DEGREE EXAMINATION, NOVEMBER 2012

Fourth Semester

ME0204 – MECHANICS OF SOLIDS

(For the candidates admitted from the year 2007-2008 onwards)

Time: Three hours Max. Marks: 100

Answer **ALL** Questions

PART – A (10 × 2 = 20 Marks)

1. Define: Bulk modulus.
2. How do thermal stress occur?
3. Define: Section modulus.
4. Draw shear force and bending moment for a simply supported beam with an eccentric point load.
5. Write expression for energy stored in a spring.
6. What are the assumptions made in deriving torsion equation?
7. What is an elastic curve of a beam?
8. State Castigliano's theorem.
9. State condition for a thin cylinder.
10. Define: Slenderness ratio.

PART – B (5 × 16 = 80 Marks)

11. a. A tensile load of 40 kN is acting on a rod of diameter 40 mm and of length 4 m. A bore of diameter 20 mm is centrally made in the rod. To what length the rod should be bored so that the total extension will increase 30% under the same tensile load. Take $E = 2 \times 10^5$ N/mm^2.

(OR)

b. At a point in a body, two mutually perpendicular stresses acting are 80 N/mm^2 tensile and 40 N/mm^2 tensile. Each of the above stresses is accompanied by a shear stress of 60 N/mm^2. Determine the normal stress, shear stress and the resultant stress on an oblique plane inclined at an angle of 45° with the axis of minor tensile stress.

12. a. Draw the shear force and bending moment diagram for a simply supported beam of length 8 m carrying a uniformly distributed load of 10 kN/m for a span of 4 m starting from 1 m from the left end. Calculate the maximum bending moment and its position.

(OR)

b. A timber beam of rectangular section is simply supported at the ends and carries a point load at the centre of the beam. The maximum bending stress is 12 N/mm^2 and maximum shearing stress is 1 N/mm^2. Find the ratio of span to depth.

13. a. A hollow shaft, having an internal diameter 40% of its external diameter, transmits 562.5 kW power at 100 rpm. Determine the external diameter of the shaft if the shear stress is not to exceed 60 N/mm^2 and the twist in a length of 2.5 m should not exceed 1.3°. Assume maximum torque is 1.25 times the mean torque and modulus of rigidity is 9×10^4 N/mm^2.

(OR)

b. The stiffness of a close coiled helical spring is 1.5 N/mm of compression under a maximum load of 60 N. The maximum shearing stress produced in the wire of the spring is 125 N/mm^2. The solid length is 5 cm. Find (i) diameter of wire (ii) mean diameter of coils (iii) number of coils required. Take $C = 4.5 \times 10^4$ N/mm^2.

14. a. Determine the deflection of a simply supported beam with an eccentric point load by double integration method.

(OR)

b. A cantilever of length 2 m carries a uniformly varying load of 25 kN/m at the free end to 75 kN/m at the fixed end. If $E = 1 \times 10^5$ N/mm^2 and $I = 10^8$ mm^4, determine the scope and deflection of the cantilever at the free end.

15. a. Find the Euler's crushing load for a hollow cylindrical cast iron column 20 cm external diameter and 25 mm thick if it is 6 m long and is hinged at both ends. Take $E = 1.2 \times 10^6$ N/mm^2. Compare the load with the crushing load as given by Rankine's formula, taking $\sigma_c = 550$ N/mm^2 and $a = \frac{1}{1600}$, for what length of the column would these two formulas, give the same crushing load.

(OR)

b. A cylindrical shell 90 cm long 20 cm internal diameter having thickness of 8 mm is filled with fluid at atmospheric pressure. If an additional 20 cm^3 of fluid is pumped into the cylinder, find (i) the pressure exerted by the fluid on the cylinder and (ii) the hoop stress induced. Take $E = 2 \times 10^5$ N/mm^2 and $\mu = 0.3$

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