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Reg. No. : .....

Name : .....

Third Semester B.Tech. Degree Examination, December 2015
(2008 Scheme)
08.304 : Mechanics Of Solids (SMPU)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Part* ***A*** *: Answer* ***all*** *questions.* ***Each*** *question carries* ***5*** *marks.*

2) Part **B** *: Answer* ***one full*** *question from* ***each*** *Module.* ***Each*** *question carries* ***20*** *marks.*

PART – A

1. Explain elastic limit, Hooke's law and Poisson's ratio.
2. Derive the relation for change in length of a tapered circular bar of diameter D1 at one end and diameter D2 at the other end and length L carrying a load of F.
3. Derive an expression for volumetric strain of a body subjected to stresses in three mutually perpendicular directions.
4. Draw the Shear Force and Bending Moment diagrams for a simply supported beam with equal overhang on either side carrying uniformly distributed load 'w' per unit run over the whole length. Span length is 'l' and overhanging length is 'a'. Consider the three cases of $l > 2a$.
5. Derive the expression for shear stresses for an I beam and plot the variation of stresses across the section.
6. Give the assumptions made in the theory of pure torsion. Write down the torsion formula.
7. Explain core of a section. Find an expression for the core of a circular section.
8. What is meant by plane perfect frame ? Explain method of joints. **(8×5=40 Marks)**

P.T.O.

PART– B

Module – I

9. a) Two steel rods 2.5 m long and 20 mm diameter and one copper rod 2 m long and 20 mm diameter together support a load of 30 kN. The loaded end is at the same level and the other end is rigidly fixed. Find the stresses in the rods. $E_s = 210$ kN/mm^2, $E_c = 110$ kN/mm^2.

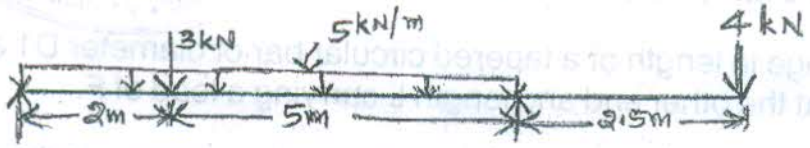
   b) Derive expression to find the stresses developed in a body when it is subjected to impact load.

10. a) Find the values of maximum and minimum principal stresses in a block subjected to two tensile stresses 80 Mpa and 60 Mpa along with a shear stress of 40 Mpa.

    b) Show that in a strained material subjected to two dimensional stresses the sum of the normal components of stresses on any two mutually perpendicular planes is constant.

Module – II

11. Determine the values of shear force and bending moment and draw the diagrams for the beam loaded as shown below.



12. A simply supported beam AB carries a uniformly distributed load of 2 kN/m for the whole span and a concentrated load 5 kN at one third span from A. Span AB is 6 m. Calculate slope at supports and deflection at midspan. Take flexural rigidity as 3×10^4 kNm^2.

Module – III

13. a) List the assumptions made in the Euler's buckling theory.

    b) In a tensile test a test piece 25 mm in diameter, 200 mm gauge length stretched 0.0975 mm under a pull of 50 kN. In a torsion test the same rod is twisted to 0.025 radian over a length of 200 mm, When a torque of 400 Nm was applied. Evaluate the Poisson's ratio and the three elastic moduli for the material.

14. a) Calculate the safe compressive load on a hollow cast iron column whose one end is rigidly fixed and other end is hinged. The external diameter is 200 mm and internal diameter 150mm and 8m length. Use Euler's formula with a factor of safety of '3' and $E = 2 \times 10^5$ N/mm^2.

    b) A circular cast iron column of diameter 250 mm carries a vertical load of 600 kN at a distance of 35 mm from the axis. Find the extreme values of the stresses induced in the section.