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B.E DEGREE EXAMINATION, NOVEMBER/ DECEMBER 2011
(Regulation 2004)

Fourth Semester Mechanical Engineering

CE295 STRENGTH OF MATERIALS

Time: Three hours Max Marks: 100

Answer ALL questions

PART-A (10 x 2 = 20 marks)

1. Differentiate a rigid body and a deformable body.

2. Derive a relation for change in length of a uniform circular bar hanging freely under its own weight.

3. What are the advantages of Mohr's Circle?

4. Draw shear force diagram for a simply supported beam of length l carrying a uniformly varying load of intensity zero at one end and w per unit length at the other end.

5. Explain the theory of simple bending.

6. Show that the shear stress distribution over a rectangular section is parabolic.

7. With reference to fixed shafts, what do you mean by fixing torques?

8. Write down the formula for maximum deflection of a simply supported beam of length l carrying a uniformly varying load of intensity zero at one end and w per unit length at the other end.

9. What is meant by M/EI diagram?

10. Derive a relation for strain energy due to flexure.

PART-B (5 x 16 = 80 marks)

11. Two circular bars A and B of the same material are subjected to the same pull (P) and are deformed by the same amount. What is the ratio of their length, if one of them has a constant diameter of 60mm and the other uniformly tapers from 80mm at one end to 40mm at the other?

12.a) An element in a strained body is subjected to a compressive stress of 200MPa and a clockwise shear stress of 50MPa on the same plane. Analytically calculate the values of normal and shear stress on a plane inclined at 35° with the compressive stress. Also calculate the maximum shear stress in the element.

(or)

12. b) A thin cylindrical shell 1m in diameter, 3 m length and a wall thickness of 10mm is subjected to an internal pressure of 1.5MN/m^2. Calculate the stresses, strain, change in dimensions. Hence change in volume. Assume the modulus of elasticity and Poisson's ratio of the shell material as 200 GN/m^2 and 0.3 respectively.

13.a) A simply supported beam AB of span 6 m carries a gradually varying load of zero at support A and 6 kN/m at the other support B. Draw SFD and BMD. Calculate the position and magnitude of maximum bending moment.

(or)

13.b) A vertical flag staff standing 10m above the ground is of square section throughout, the dimensions being 100mmx100mm at the top tapering uniformly to 200mm x 200mm at the ground. A horizontal pull of 50N is applied at the top, the direction of the loading being along a diagonal of the section. Find the maximum stress due to bending.

14.a) A closely coiled helical spring is made with 10 mm diameter wire and is having mean diameter of 120 mm and 12 complete turns. The modulus of rigidity of the material of spring is 78 kN/mm^2, where a load of 580 N is applied, find

(i) Maximum shear stress (4)
(ii) Strain energy stored (4)
(iii) Deflection produced (4)
(iv) Maximum bending stress (4)

(or)

14.b) A simply supported beam ACB ,supported at A and B of span l is subjected to a point W at C.(AC=a and CB=b and a is less than b). Find the expressions for slope at the supports and maximum deflection. Use Moment Area method.

15.a) A cantilever beam of length 2m carries a point load of 15kN at a distance of 1m from the fixed end and another point load of 10kN at free end. Determine the slope and deflection at free end using conjugate beam method.
Take EI=3000kN-m^2.

(or)

15.b) Determine the maximum deflection of a simply supported beam with UDL over entire span using principle of virtual work method.