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END SEMESTER EXAMINATIONS, OCT/NOV 2012
IV SEMESTER B.E. MECHANICAL ENGINEERING
(Common to Mechanical Engineering Tamil Medium)

CE 9213 STRENGTH OF MATERIALS

Time : 3 Hours Max.Marks : 100

PART – A (10 x 2 = 20 marks)

1. Define elastic limit.
2. Write down the relationship between Young's Modulus and Bulk Modulus.
3. Define point of contra flexure?
4. A simply supported beam of 4 m long carries a point load of 10 kN at mid span. Sketch the BMD.
5. Sketch the shear stress distribution for a T-section.
6. Write down the expression for Torsional moment carrying capacity of a solid circular shaft.
7. State Moment Area theorems.
8. Draw qualitative conjugate beam for any two beams.
9. Differentiate thick and thin cylinders.
10. Write down the formula for change in volume of a thin cylinder.

PART-B (5 x 16 = 80 marks)

11. Draw SFD and BMD for the beam given in fig. Q11. Also locate the point of contra flexure if any.

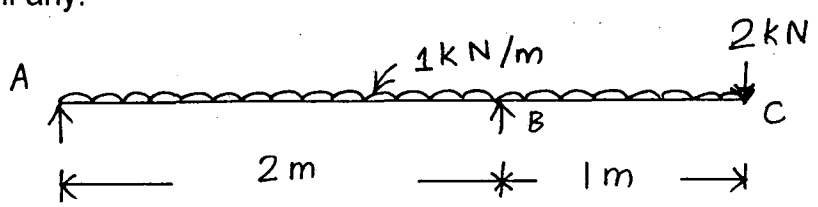

Fig Q.11.

12.a) A bar of cross section 8 mm x 8 mm is subjected to an axial pull of 7000N. The lateral dimension of the bar is found to be changed to 7.9985 mm x 7.9985 mm. If the modulus of rigidity of the material is 0.8×10^5 N/mm^2, determine the Poisson's ratio and modulus of elasticity.

(or)

12.b) At a point in a strained material, the stresses are p_x=100N/mm^2, p_y= -70N/mm^2, q = +90 N/mm^2. Determine the principle planes, principle stresses, normal and shear stresses.

13.a) A timber beam of rectangular section is to support a load of 24 kN uniformly distributed over a span of 4 m when beam is simply supported. If the depth of section is to be twice the breadth, and the stress in the timber is not to exceed 10 N/mm^2, find the dimensions of the cross section.

OR

(b) Define abrasive wear resistance. Discuss the dependence of abrasive wear resistance on *any three* of the following parameters: i) hardness, ii) elastic modulus, iii) heat-treatment and iv) grain orientation. (2+14)

14. (a) (i) State the *Bowden & Tabor's simple adhesion theory* of friction. What are the drawbacks of this theory? (8)
(ii) Derive Archard's equation for adhesive wear stating the *assumptions* clearly. (8)

OR

(b) (i) What is Ratchet mechanism? (3)
(ii) Derive an expression for the coefficient of friction μ_{Rat} in terms of the slant angle θ and the true adhesive component of the coefficient of friction μ_0. (6)
(iii) What are the material requirements for the fluid-film lubricated bearings operating at low stresses? (5)
(iv) Name two different material systems suitable for such applications. (2)

15. (a) (i) What is the principle of hydrodynamic lubrication? Write Reynolds equation for combined longitudinal and normal motion. (3+3)
(ii) Define load capacity. (2)
(iii) Draw a journal bearing and show different parts of it. (4)
(iv) What are the basic differences between the hydrodynamic and hydrostatic lubrication systems? (4)

OR

(b) (i) Consider the *step bearing* as shown in ***Fig. 1***. Starting from the *Reynolds equation* for pressure gradient for the longitudinal motion, obtain the *pressure distribution function, p(x)*, along the length of the step bearing. (8)
(ii) Derive the expression for *load capacity* for the step bearing in terms of maximum pressure, p_S. (4)
(iii) Define *reduced pressure parameter*. Why is it used? (4)

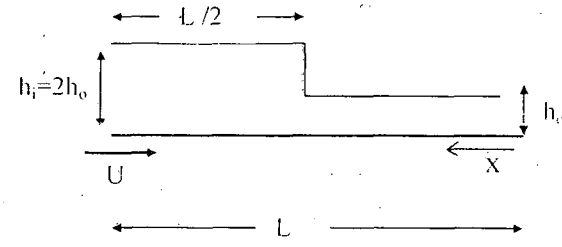

Fig. 1

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