Exam.Code:0940
Sub. Code: 7047

2010

B.E. (Mechanical Engineering) Fourth Semester

MEC-402: Mechanics of Materials – II

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit. Use usual notations and symbols for derivations. Assume suitably missing data if any.

x-x-x

I. Give short answers to the following:-

a) What do you know about metal-wire-electrical-resistance strain gauges?

b) What is stable, neutral, and unstable equilibrium?

c) Write down the expression for critical load for a *fixed-fixed* column.

d) What is Castigliano's second theorem?

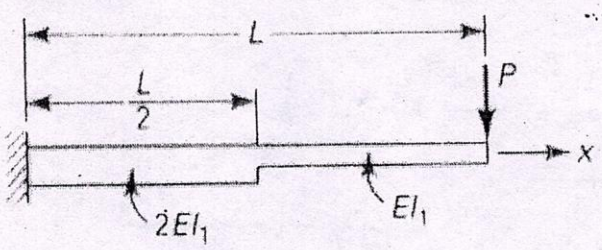
e) What are the first and second moment-area theorems? (5x2)

UNIT – I

II. At a point in the structural member, the 2D stresses are $\sigma_x = 80MPa$, $\sigma_y = 40MPa$, and $\tau_{xy} = 30MPa$. Determine with formulas and Mohr's circle (a) the magnitude and orientation of the principal stresses and (b) the magnitude and orientation of the maximum shearing stresses and associated normal stresses. In each case, show the results on a properly oriented element; Represent the stress tensor in matrix form. (10)

III. A piece of chalk of ultimate strength σ_u is subjected to an axial force producing a tensile stress of $0.75\sigma_u$. Applying the principal stress theory of failure, determine the shear stress produced by a torque that acts simultaneously on the chalk and the orientation of the fracture surface. (10)

IV. A force P is applied at the free end of a stepped cantilever beam of length L. Determine the deflection of the free end.

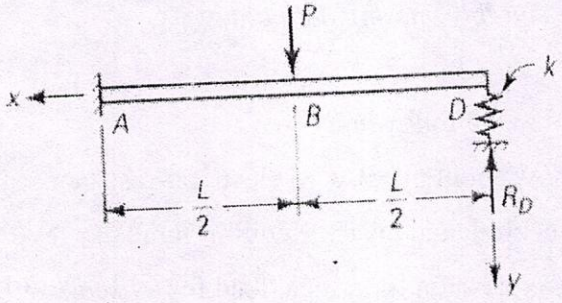


(10)

P.T.O.

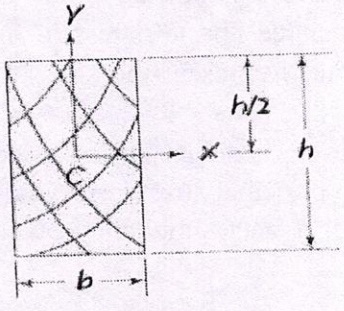
UNIT – II

V. The built-in beam is supported at one end by a spring of constant k. Determine the redundant reaction.



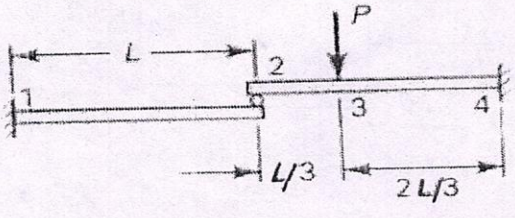
(10)

VI. A pinned-end wood bar of width b by depth h rectangular cross section and length L is subjected to an axial compressive load. Determine (a) the slenderness ratio; (b) the allowable load, using a factor safety *of n*. Use b = 60 mm, h = 120 mm, L = 1.8 m, n = .1.4, E = 12 GPa, and σ_u = 55 MPa.



(10)

VII. Obtain the collapse load of the structure shown. Assume that plastic hinges form at 1, 3, and 4.



(10)

x-x-x