B. Tech. DEGREE EXAMINATION, MAY - 2015

(Examination at the end of Second Year)

MECHANICAL ENGINEERING

Paper - II : Advanced Mechanics of Materials

Time : 3 Hours **Maximum Marks : 75**

Answer question No.1 compulsory *(15)*

Answer ONE question from each unit *(4 × 15 = 60)*

1) a) Macaulay's method.

b) Use of compound cylinders.

c) Write any two assumptions are mode to derive lame's theory.

d) What is meant by effective length of a column?

e) Write the equation of stress for a curved bar subjected to bending moment?

f) How can you draw BMD of a continuous beam?

g) State the Clapeyron's theorem of three moments.

UNIT - I

2) a) Explain clearly about the procedure to find the deflection of a beam using moment area method.

b) A beam has supports '1' apart with equal overhangs 1/3 over each support. It carries a load W at each end and a load 2W at the centre. Find the slopes at the free end and at the support. Find also the deflections at the free end and at the centre.

OR

3) a) A column of circular section has 150mm diameter and 3m length. Both ends of the column are fixed. The column carries a load of 100kN at an eccentricity of 15mm from the geometrical axis of the column. Find the maximum compressive stress on the column section. Find also the maximum permissible eccentricity to avoid tension in the column section. Take $E = 1 \times 10^5$ N/mm^2.

b) A cantilever of uniform cross-section of length l carries two point loads, W at the free end and 2W at a distance a from the free end. Find the maximum deflection due to this loading.

UNIT – II

4) a) Briefly discuss Clapeyron's theorem of three moments.

b) A beam ABCD 9m long is simply supported at A,B,C such that the span AB is 3m, span BC is 4.5m and the overhang CD is 1.5m. It carries a uniformly distributed load of 1.5kH/m in span AB and a point load of 1kN at the free end D. The moment of inertia of the beam in span AB is l and that in the span BC is 2l. Draw the bending moment and shear force diagrams for the beam.

OR

5) A continuous beam ABCD 20m long is fixed at A, simply supported at D and carried on the supporters B&C at 5m and 12m from left end A. It carries two concentrated loads of 80kN and 40kN at 3m and 8m respectively from A and uniformly distributed load of 12kN/m over the span CD. Analyze the beam by theorem of three moments and draw the shear force and bending moment diagrams.

UNIT - III

6) A thick cylindrical pipe of internal radius of 12CM and external radius 16CM is subjected to an internal fluid pressure of $120 kg/cm^2$. Determine the maximum and minimum hoop stresses in the cross-section. Also sketch the hoop stress distribution across the section. What is the percentage error if the maximum hoop stress is found from the equation for this pipes.

OR

7) Derive the necessary equations involved in Winkler-Bach theory to determine the stresses in a curved beam.

UNIT – IV

8) a) Derive the expression for the thickness of a rotating dise of uniform strength.

b) A steam turbine voter is 160mm diameter below the blade ring and 25mm thick. The turbine is running at 36500rpm. The allowable stress is 150Mpa. What is the thickness of the rotor at radius of 50mm, and at the centre. Assume uniform strength and take density of material = $7800 kg/m^3$

OR

9) A hollow disc of external diameter 90cm is rotating at a speed of 4000rpm. Determine the distribution of radial and hoop stresses in the disc. Poisson's ratio is 0.29 and the density of material is $950\ kg/m^3$.

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