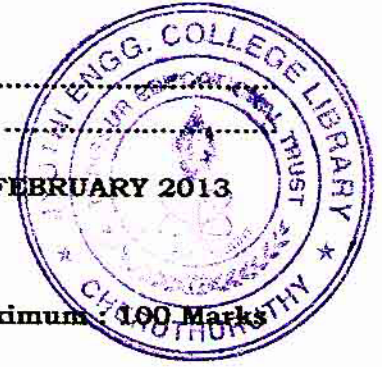


Name :

Reg.No:

THIRD SEMESTER B.TECH (04 SCHEME) DEGREE EXAMINATION, FEBRUARY 2013

AM/ME 04 304 – MECHANICS OF SOLIDS



Time : Three Hours

Maximum : 100 Marks

Part A (Answer all questions)

- I. 1. State and explain Hooke's law
2. Explain the term complimentary shear stress
3. Derive the relation connecting bending moment shear force and rate of loading
4. Obtain expression for section modulus of a hollow circular section
5. Explain conjugate beam method
6. Using moment area method derive the expressions for deflection at the free end of a cantilever beam loaded with concentrated load at the free end
7. Define a short strut and a long column. How does their analysis differ?
8. Derive the buckling load for a column with both ends fixed by Euler's theory

(8 X 5 Marks = 40 Marks)

PART B

- II. 9. A brass bar of 25 mm diameter is enclosed in a steel tube of 25 mm internal diameter and 50 mm external diameter. Both of them are 1m long at room temperature and fastened rigidly to each other at the ends. If the room temperature is 20°C, find to what temperature the assembly should be heated so as to generate a compressive stress of 48.7 MN/m² in brass. What is the stress in steel at this temperature? Take $E_s = 200 \text{ GN/m}^2$, $E_b = 100 \text{ GN/m}^2$, $\alpha_s = 11.6 \times 10^{-6} / ^\circ\text{C}$, $\alpha_b = 18.7 \times 10^{-6} / ^\circ\text{C}$.

Or

10. A rectangular block of material is subjected to a tensile stress of 100 MN/m² on one plane and a tensile stress of 50 MN/m² on plane at right angles together with the shear stress of 60 MN/m². Find the principal stresses and position of principal planes. Also find the maximum shear stress and its plane

- III. 11. An overhanging beam ABC length 4 m supported on AB of length 3 m. The overhanging portion BC is of length 1m. A UDL of 1kN/m is acting over a length of 2m from left support and at the free end C. Draw SF and BM diagrams. Also find the location of point of contra flexure

Or

Turn over

12. At a given section of an I-beam the value of vertical shear force is 40 kN and the sectional dimensions are Flange width 200mm, Flange thickness 30 mm, Web thickness 40 mm, Total depth 300 mm. Draw the shear stress distribution diagrams for the given section. Also find in what proportion the total shearing force is carried by the web

- IV. 13. A beam with a span of 6m carries a point load of 40 kN at 4m from the left support. If for the section $I_{xx} = 73.3 \times 10^8 \text{ m}^4$ and 2000 GN/m^2 . Find the deflection of slope under the load and position and amount of maximum deflection.

Or

14. A cantilever 2m long is of rectangular section 120 mm wide and 240 mm deep. It carries a UDL of 2.5 kN/m length for a length of 1.25m from the fixed ends and a point load of 1kN at the free end. Assuming $E = 10 \text{ GN/m}^2$ calculate the slope and deflection at the free end of the cantilever and at a distance of 1.25 m from the fixed end

- V. 15. A hollow shaft is of external diameter 70 mm and diameter ratio 0.8. It transmits a power of 2HP at 25 rpm. If the maximum torque exceeds the average torque by 25%, draw the shear stress distribution across the section of the shaft.

Or

16. Derive an expression for critical stress developed in a long column hinged at both ends

(4 X 15 Marks = 60 Marks)
