Roll No.

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B. TECH

THIRD SEMESTER EXAMINATION, 2002-2003

STRENGTH OF MATERIALS

Time : 2 Hours *Total Marks : 50*

Note : (1) Attempt **ALL** questions.

(2) Missing data, if any, may be suitably assumed.

1. Answer any TWO of the following :— (6×2)

    (a) Show that if E is assumed correct, an error of 1% in the determination of G will involve an error of about 5% in the calculation of Poisson's ratio when its correct value is 0·25.

    (b) Briefly explain Theories of Failure.

    (c) Compare the weights of hollow and solid shafts of equal lengths to transmit a given torque of the same maximum shear stress, if the inside diameter is 2/3 of the outside.

2. Answer any TWO of the following :— (6×2)

    (a) Calculate the dimensions of the strongest section, that can be cut, of a circular log of wood 25 cm in diameter.

    (b) A simply supported prismatic beam AB carries a uniform distributed load of intensity w over its span 'l'. Develop the equation of the elastic line and find the maximum deflection δ at the middle of the span.

(c) Using Moment Area Method, determine the deflection δ and slope θ at the free end of a cantilever carrying a concentrated load P at the free end.

3. Answer any TWO of the following :— (6·5 × 2)

(a) A slender column of length l is built in at its lower end A and laterally supported at its upper end. Find the first critical value of the compressive load P.

(b) A boiler drum consists of a cylindrical portion 2 m long, 1 m diameter and 25 mm thick, closed by hemispherical ends. In a hydraulic test to 10 N/mm^2, how much additional water will be pumped in, after initial filling at atmospheric pressure ? Assume the circumferential strain at the junction of cylinder and hemisphere is the same for both. For the drum material, $E = 2,07,000$ N/mm^2, $\mu = 0.3$. For water $K = 2100$ N/mm^2.

(c) Calculate the critical load of a strut, which is made of a bar circular in section and 5 m long and which is pin-jointed at both ends. The same bar when freely supported gives mid-span deflection of 10 mm with a 80 N load at the centre.

4. Answer any TWO of the following :— (6·5 × 2)

(a) The cylinder of a hydraulic ram is of 6 cm internal diameter. Find the thickness required to withstand an internal pressure of 40 N/mm^2, if the maximum tensile stress is limited to 60 N/mm^2 and the maximum shear stress to 50 N/mm^2.

(b) Derive Lame's equations to find out the stresses in thick spherical shells.

(c) Explain any TWO of the following :—

(i) Stress concentration and notch sensitivity

(ii) Creep and Creep strength

(iii) Endurance limit

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