D 1805

(2 pages)

Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION

DECEMBER 2004

CE/EE-2K-302/PTCE-2K-302/PT-2K-403 – MECHANICS OF SOLIDS

(New Scheme)

Time : Three Hours

Maximum : 100 Marks

Answer **all** *questions.*

Assume suitable data that are not given.

I. (a) State and Explain Hooke's law.

(b) Derive the expression for normal stress on a plane inclined at an angle θ to the x axis and subjected to normal stresses in x and y direction.

(c) Give the different types of supports with the reactions.

(d) Explain how the stress is proportional to the distance from the neutral axis.

(e) State the rules to be adopted in using Mecaulay's method.

(f) Give the conjugate beam for (i) cantilever beam, (ii) simply supported beam, (iii) over hanging beam with overhang on one side.

(g) List the assumptions made in Euler's formula.

(h) What is a compound cylinder ? Explain it's advantage.

(8 × 5 = 40 marks)

II. (a) A reinforced concrete column is 300 m.m. × 300 m.m. in section. The column is provided with 8 bars of 20 m.m. diameter. The column carries a load of 250 kN. Find the stresses induced in concrete and steel bars. If the length of the column is 3 m, find the change in length of the column $E_c = 0.14 \times 10^5$ N/mm², $E_s = 2.1 \times 10^5$ N/mm². (15 marks)

Or

(b) Direct stresses of 120 N/mm² tensile and 90 N/mm² compressive exist on two perpendicular planes at a certain point in a body. They are accompanied by shear stresses on these planes. The greater principal stress at the point due to these is 150 N/mm². What must be the magnitude of the shearing stresses on the two planes ? Find also the other principal stress and the maximum shear stress at the point. (15 marks)

Turn over

III. (a) Sketch the S.F.D. and B.M.D. for the beam shown in Fig. 1. (15 marks)

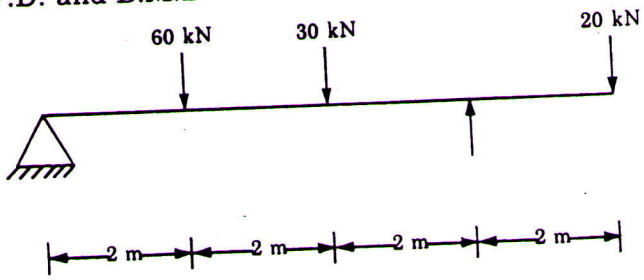

Fig. 1

Or

(b) A steel cantilever beam 3 m. long is to carry a concentrated load of 10 kN at the free end. The permissible bending stress is 150 N/mm^2. Design the beam as a (i) solid circular section and (ii) hollow circular section of $d_i = 0.8\ d_o$. (15 marks)

IV. (a) A simply supported beam of span 12 m is subjected to point loads of 80 kN and 50 kN acting at 3 m and 9 m respectively from the left support. Calculate the deflections under the loads. (15 marks)

Or

(b) A simply supported beam of span L is acted upon by two point loads 'N' each at $\frac{1}{3}$ span points. Calculate the deflection at mid span and maximum slope for the beam using conjugate beam method. (15 marks)

V. (a) A solid shaft of 100 m.m. diameter and 6 m. length is subjected to a torque of 6000 Nm. Find the maximum intensity of shear stress and the angle of twist G = 0.8 × 10^5 N/mm^2. (15 marks)

Or

(b) A channel section shown in Fig. 2 made of aluminium alloy with E = .75 × 10^5 N/mm^2 and length 1000 mm. is used as a column with both ends hinged. Estimate the buckling load of the member. If it is supported at the mid height along the flange calculate the buckling load. (15 marks)

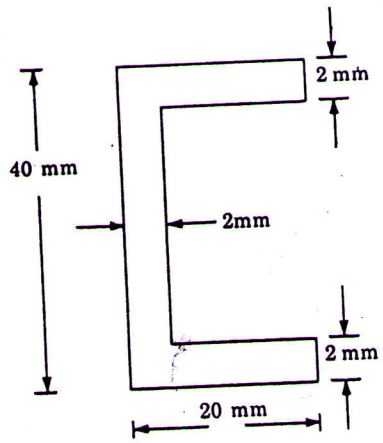

Fig. 2