PVP 14

Code: CE4T3

II B.Tech - II Semester – Regular / Supplementary Examinations
October 2020

MECHANICS OF SOLIDS-II
(CIVIL ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11 x 2 = 22 M

1.

a) Calculate the length of the beam, if the deflection at the free end of a uniformly loaded cantilever beam is 15mm and the slope of the deflection curve at the free end is 0.02 radian.

b) A simply supported beam of length 'l' subjected to an UDL of intensity w per unit length over entire span. Give the expressions for maximum slope and deflection for this loading.

c) Define principal plane and principal stress.

d) Define the state of simple shear.

e) What are the assumptions made in the analysis of thin cylinders?

f) What do you understand by the term Theories of failure? Name the important theories of failure.

g) Calculate the load carrying capacity using Euler's Formula for a rectangular column having 300 mm x 400 mm size

and 4 m length. The ends of the column are fixed. Take $E = 1.6 \times 10^5$ N/mm^2.

h) State the limitations of Euler's theory.

i) Define column and effective length of a column. Distinguish between a column and a strut.

j) Define shear centre. What is the importance of shear centre?

k) What do you understand about term Unsymmetrical bending.

PART – B

Answer any ***THREE*** questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) A beam AB is simply supported over a span 5m. A concentrated load of 30kN is acting at a section 1.25m from left support. Calculate the deflection under the load point. Take $E = 200 \times 10^6$ kN/m^2 and $I = 13 \times 10^{-6}$ m^4. 8 M

b) A beam AB of span '*l*' is simply supported at A and B and carries a point load 'W' at the centre 'C' of the span. The moment of inertia of the beam section is 'I' for the left half and '2I' for the right half. Calculate the slope at each end and at the centre and also calculate the deflection at the centre, use conjugate beam method. 8 M

3. a) The stresses at a point in a bar are 200N/mm^2 (tensile) and 100 N/mm^2 (compressive). Determine the resultant stress

in magnitude and direction on a plane inclined at 60^0 to the axis of major stress. Also determine the maximum intensity of shear stress in the material at that point. 8 M

b) Two mutually perpendicular planes of an element of material are subjected to direct stress of 10.5 MPa (tensile) and 3.5 MPa (Compressive) and shear stress of 7 MPa. Find the (i) magnitude and direction of principal stress (ii) magnitude of the normal and shear stress on a plane on which the shear stress is maximum. 8 M

4. a) A cylindrical shell 1 metre long, 180mm internal diameter, thickness of metal 8mm is filled with a fluid at atmospheric pressure. If an additional volume 20000 mm^3 of the fluid is pumped into the cylinder, find the pressure exerted by the fluid on the wall of the cylinder. Find also the hoop stress induced. Take $E=2x10^5$ N/mm^2 and 1/m or $\mu = 0.3$. 9 M

b) Explain in detail the Maximum Principal stress theory and Maximum strain energy theory. 7 M

5. a) A hollow cast iron column whose outside diameter is 200mm has a thickness of 20mm. It is 4.5m long and is fixed at both ends. Calculate the safe load by Rankine's formula using a factor of safety 4. Calculate the slenderness ratio and the ratio of Euler's and Rankine's critical load. 8 M

b) A simply supported beam of length 4m is subjected to a uniformly distributed load of 30 kN/m over the whole span and deflects 15 mm at the centre. Determine the crippling load the beam is used as a column with the following conditions:
(i) One end fixed and another end hinged
(ii) Both the ends are pin jointed. 8 M

6. a) A simply supported beam T-section, 2.5m long carries a central concentrated load inclined at 30^0 to the Y-axis. If the maximum compressive and tensile stresses are not to exceed 75 MPa respectively. Find the maximum load, the beam can carry. 8 M

b) Derive the equation for shear centre of channel section. 8 M