

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

- Q.1(a) For the element shown in Fig. Q.1(a), determine the values of σ_x and σ_y if the principal stresses are known to be 20 MPa and -80 MPa. [5] CO BL
CO2 Apply

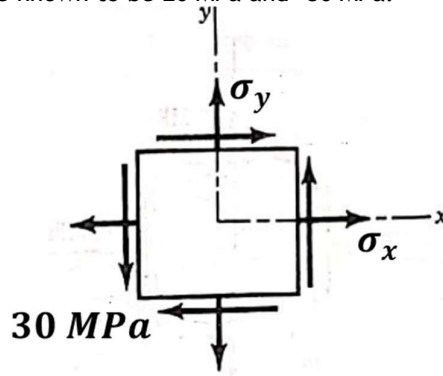


Fig. Q.1(a)

- Q.1(b) A state of stress is defined by $\epsilon_x = -400 \times 10^{-6}$, $\epsilon_y = 200 \times 10^{-6}$, and $\gamma_{xy} = 800 \times 10^{-6}$. If $E = 200 \text{ GPa}$ and $\nu = 0.3$, determine the principal stresses and maximum shearing stress. [5] CO3 Analyze

- Q.2(a) Derive the relationship between load, shear force, and bending moment for beam problems. [2] CO1 Understand

- Q.2(b) Write the shear force and bending moment equations for the cantilever beam as shown in Fig. Q.2(b). Also, draw the shear force and bending moment diagram, specifying values at load changing points. Take $w_0 = 50 \text{ kN/m}$, and $L = 2 \text{ m}$. [4] CO3 Analyze

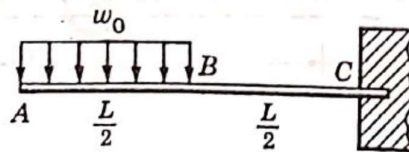


Fig. Q.2(b)

- Q.2(c) In a laboratory test of a beam loaded by end couples, the fibers at layer AB in Fig. Q.2(c) are found to increase $60 \times 10^{-3} \text{ mm}$ whereas those at CD decrease $100 \times 10^{-3} \text{ mm}$ in the 200 mm gage length. Using $E = 70 \text{ GPa}$, determine the flexural stress at the top and bottom fibers. [4] CO2 Apply

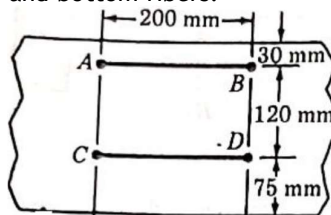


Fig. Q.2(c)

- Q.3(a) The simply supported beam shown in Fig.Q.3(a) carries a uniform load of intensity w_0 symmetrically distributed over part of its length. Determine the maximum deflection δ . [6] CO4 Evaluate

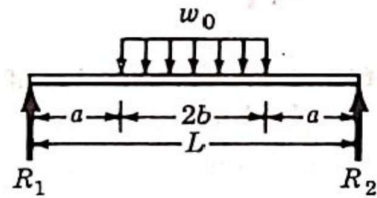


Fig.Q.3(a)

- Q.3(b) A 50 mm diameter steel shaft rotates at 240 rpm. If the shearing stress is limited to 80 MPa, determine the maximum power that can be transmitted. [4] CO2 Apply

- Q.4(a) A circular bar is bent into the shape of a half ring and supported vertically as shown in Fig.Q.4(a). Determine the horizontal movement of point C. [5] CO4 Evaluate

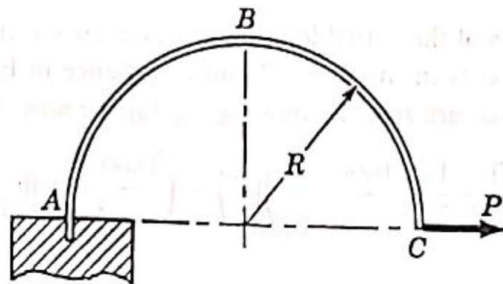


Fig.Q.4(a)

- Q.4(b) Write a short note on limitation of Euler's long column formula. [5] CO1 Understand

- Q.5(a) Derive expressions for tangential and radial stresses for a thick-walled cylinder subjected to inside and outside pressure P_i and P_o , respectively. [6] CO1 Understand

- Q.5(b) A tank shown in Fig.Q.5(b) is fabricated from 1 mm thick steel sheet. Calculate the longitudinal and circumferential stresses caused by an internal pressure of 500 kPa. [4] CO2 Apply

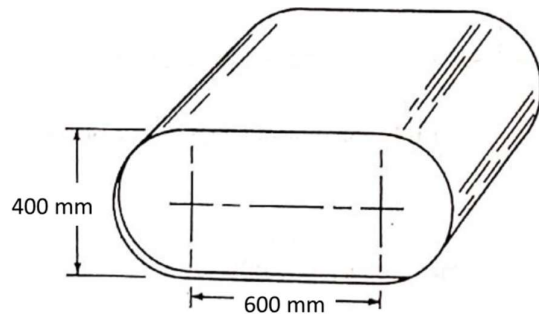


Fig.Q.5(b)