

Time : 3 Hours

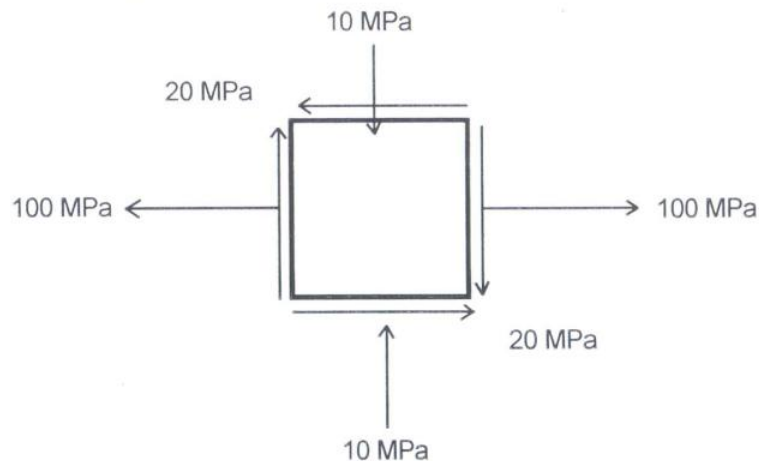
Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt any five questions in all, select one question from each sections A, B, C and D. Section E is compulsory.

SECTION - A

1. Stresses on two perpendicular planes are shown below. Find the Principal stresses and the principal planes. (20)



2. Give various theories of failure with their graphical representations. (20)

SECTION - B

3. A bar of length 2 m with rectangular cross-section 50 mm x 80 mm is subjected to an axial load of 1.2 kN. Determine the maximum stress and strain energy developed in the bar if the load applied is (i) gradual (ii) sudden and (iii) and falls through a height of 25mm. $E = 200\text{GPa}$. (20)

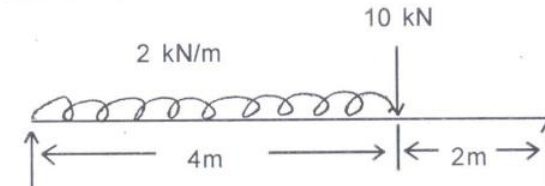
4. A simply supported beam is carrying a uniformly distributed load of 2 kN/m over a span of 6 m. Find maximum deflection with the help of strain energy method. (20)

SECTION - C

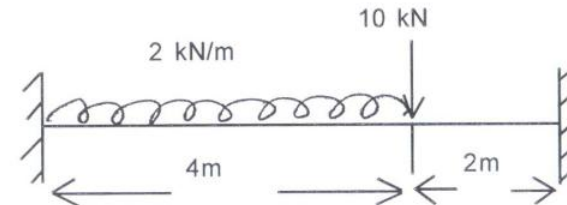
5. Derive the formulae for finding out shear stresses in beams. Show the shear stress distribution on a circular cross-section. (20)
6. Derive Euler's formulae for the elastic buckling of long column with one end hinged and other fixed. State the limitations of Euler's theory. (20)

SECTION - D

7. Find maximum deflection in the beam shown below. (20)



8. Draw the shear force diagram and bending moment diagram for the fixed beam shown below. (20)



SECTION - E

9. (i) Explain complimentary shear stress.
(ii) Find value of principal stress in case of shaft of diameter d subjected to bending moment M and torque T .
(iii) Derive expression for deflection in case of close coiled helical spring under axial loading.
(iv) Explain middle third rule for short rectangular columns.
(v) Find deflection of free end of cantilever of length/ supporting a point load W at free end by moment area method. (4×5=20)