43(2)STRU - II

2012

STRUCTURE - II

Full Marks – 100

Pass Marks – 40

Time – Three hours

The figures in the margin indicate full marks
for the questions.

I. (A) Choose the correct answers. (compulsory)

$1 \times 10 = 10$

(i) If a force acts on a body it sets up some resistance to the deformation. This resistance is known as

(a) stress

(b) strain

(c) elasticity

(d) modulus of elasticity.

(ii) The term deformation per unit length is applied for

(a) stress

(b) strain

(c) modulus of elasticity

(d) none of these.

(iii) The ratio of lateral strain to the linear strains is called

(a) modulus of elasticity

(b) modulus of rigidity

(c) bulk modulus

(d) Poisson's ratio.

(iv) The bulk modulus of a body is equal to

(a) $\dfrac{mE}{3(m-2)}$

(b) $\dfrac{mE}{3(m+2)}$

(c) $\dfrac{mE}{2(m-2)}$

(d) $\dfrac{mE}{2(m+2)}$

(v) If a cantilever beam is subjected to a point load at its free end, then the S.F under the point load is

(a) zero

(b) less than the load

(c) equal to the load

(d) more than the load.

(vi) The B.M. at the free end of a cantilever beam carrying any type of load is

(a) zero

(b) minimum

(c) maximum

(d) equal to the load.

(vii) The point of contraflexure is a point where

(a) S. F. changes sign

(b) Bending moment changes sign

(c) S. F. is maximum

(d) B. M. is maximum.

(viii) The N.A. of a section is an axis, at which the bending stress is

(a) minimum

(b) zero

(c) maximum

(d) infinity.

(ix) When a cantilever is loaded at its free end maximum compression stress shall develop at

(a) bottom fibre

(b) top fibre

(c) neutral axis

(d) centre of gravity.

(x) Limit of proportionately depends upon

(a) type of loading

(b) area of cross-section

(c) type of material

(d) none of the above.

(B) State whether True / False : [Compulsory]

1×10=10

(i) The stress has no units.

(ii) The limiting value of stress upto which a material is perfectly elastic is known as plastic limit.

(iii) The ratio of ultimate stress to working stress is called factor of safety.

(iv) The stress induced in a body due to change in temperature is known as thermal stress.

(v) In a composite section, strains in the two materials are different.

(vi) The point of contraflexure is also called as point of inflection.

(vii) A beam whose both ends are fixed is called cantilever beam.

(viii) The bending moment at the fixed end of a cantilever beam is zero.

(ix) Column made of timber is an example of composite material.

(x) In a composite section, strains in the two materials are different.

Answer any *four* questions.

2. (a) Explain the term stress and discuss types of loading on a beam. 5

(b) A hollow cylinder 2m long, has an outside diameter of 50 mm and inside diameter of 30 mm. If the cylinder is carrying a load of 25 kg, find the stress in the cylinder. Also find the deformation of the cylinder, if the value of modulus of elasticity for the cylinder material is 100 GPa. 15

3. (a) Define thermal stresses and strains. 5

(b) A steel bar 2m long, 40 mm wide and 20 mm thick is subjected to an axial pull of 160 kN in the direction of its length. Find the changes in length, width and thickness of the bar. Take, E = 200 GPa and Poisson's ratio = 0·3. 15

4. (a) What are the different types of beams depending upon the end conditions ? 5

(b) A simply supported beam 6m long is carrying a u.d.l. of 5Kw/m over a length of 3m from the right end. Draw the S.F. and B.M. diagrams for the beam and also calculate the maximum B.M. on the section. 15

5. (a) Define shear force and bending moment. 5

(b) A simply supported beam of 4m span is carrying load as shown in the figure. Draw S.F.D. and B.M.D. for the beam. 15
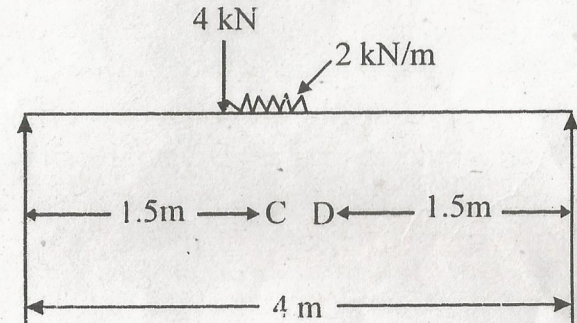
6. (a) Write down the assumption in the theory of simple bending. 5

(b) A rectangular beam 60 mm wide and 150 mm deep is simply supported over a span of 4m. If the beam is subjected to a u.d.l of 4·5 kN/m, find the maximum bending stress induced in the beam. 15

7. (a) What are the sign conventions for shear force and bending moment in general ? 5

(b) Define the expression for the bending stress in a simple beam. 15