2015

STRUCTURE-II

Paper : Eng-2·5

Full Marks : 100

Time : Three hours

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

1. Choose the correct answers :   1×5=5

    (a) If a force acts on a body, it sets up some resistance to the deformation. This resistance is known as
    (i)   stress
    (ii)   strain
    (iii) elasticity
    (iv)   modulus of elasticity

    (b) If a cantilever beam is subjected to a point load at its free end, then the S.F under the point load is
    (i)   zero
    (ii)   less than the load
    (iii) equal to the load
    (iv)   more than the load

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

    (i) modulus of elasticity

    (ii) modulus of rigidity

    (iii) bulk modulus

    (iv) Poisson's ratio

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

    (i) maximum

    (ii) infinity

    (iii) zero

    (iv) minimum

(e) The point of contraflexure is a point where

    (i) S. F. changes sign

    (ii) B. M. is maximum

    (iii) S. F. is maximum

    (iv) Bending moment changes sign.

2. State whether *True* **or** *False*.   1·25×4=5

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

    (ii) The stress has no units.

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

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

3. Answer the following :   4×5=20

    (a) Define stress and strain.

    (b) What are the types of stress and strain ?

    (c) Write down the sign convention of Shear Force and Bending Moment in general.

    (d) Define Hooke's law with appropriate graph.

    (e) What is Poisson's ratio ?

4. Write down the relations between following elastic constants.   5×2=10

    (i) Bulk modulus, Young's modulus and shear modulus.

    (ii) Bulk modulus, Young's modulus and Poisson's ratio.

5. What are the assumptions in the theory of simple Bending ?   5

6. What is Flitched Beam ?   5

7. (a) Define Bulk Modulus.

    (b) Write down about different types of beams, depending on the way the beams are supported. Support your answer with relevant sketches.   3+7=10

8. A cantilever beam AB of length L is fixed at end B and free at the end A. It carries a point load W at the end A. Develop the general expressions for the Shear Force and the Bending Moment diagrams for the cantilever.   5+5=10

9. (a) Define primary and secondary strain. A metal bar $50\,mm \times 50\,mm$ in section is subjected to an axial compressive load of $500kN$. If the contraction of a $200\,mm$ gauge length was found to be $0.5\,mm$ and the increase in thickness $0.04\,mm$, find the values of Young's modulus and Poisson's ratio for the bar material.   3+7=10

2.

Or

    (b) Define Volumetric strain.
A steel bar $50\,mm \times 50\,mm$ in cross-section is $1.2\,m$ long. It is subjected to an axial pull of $200kN$. What are the changes in length, width and volume of the bar, if the value of Poisson's ratio is 0.3? Take E as $200\ Gpa$.   3+7=10

10. (a) A simply supported beam $ABCD$ is of $5m$ span, such that $AB = 2m$, $BC = 1m$ and $CD = 2m$. It is loaded with $5kN/m$ over AB and $2kN/m$ over CD. Draw shear force and bending moment diagrams for the beam.   10

Or

    (b) Draw the SFD and BMD for the following loading condition.   10
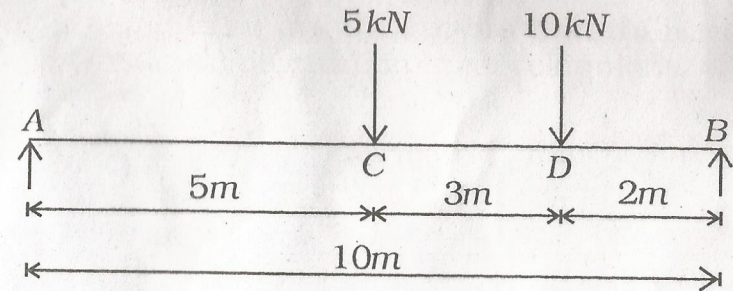
11. (a) A rectangular beam of length $3m$ and rectangular section of $80mm$ width and $120mm$ depth. If the beam is carrying a uniformly distributed load of $10kN/m$, find the maximum bending stress developed in the beam.   10

Or

    (b) Define the expression for the bending stress in a simple beam.   10

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