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C09–M–403

3503

BOARD DIPLOMA EXAMINATION, (C–09)

OCT/NOV—2013

DME—FOURTH SEMESTER EXAMINATION

STRENGTH OF MATERIALS

Time : 3 hours] [*Total Marks* : 80

PART—A

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answer should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Define the following elastic constants :

(a) Bulk modulus

(b) Rigidity modulus

2. A hollow steel column carries an axial compressive load of 200 kN. The external diameter of the column is 150 mm. Find the thickness of the material of the column. Assume allowable stress of material as 40 N/mm^2.

3. An MS specimen of 15 mm diameter and 50 mm gauge length is subjected to a sudden axial pull of 32 kN. Calculate the maximum stress and elongation. Take, E = 200 kN/mm^2.

4. List any three types of beam.

5. Define the following terms :

(a) Reactions

(b) Point of contraflexure

6. State bending equation and mention the terms.

7. A cantilever beam of length 4 m carries a point load of 10 kN at free end. Find the deflection at fixed and free ends. Take, E 20 10^5 N/mm^2 and MI = 200 10^6 mm^4.

8. A close-coiled helical spring of 200 mm mean diameter is made of 6 mm steel wire. The allowable shear stress is 125 N/mm^2. Find out the safe static load.

9. A solid circular shaft of diameter 40 mm transmits 1500 N-m torque. Find the shear stress induced in it.

10. A thin cylindrical shell having 1·5 m diameter and 5 m length is subjected to a hoop stress of 45 N/mm^2. Calculate the longitudinal strain if it is subjected to an internal fluid pressure of 15 N/mm^2. Assume Poisson's ratio as 0·32 and Young's modulus as 2 1 10^5 N/mm^2.

PART—B

Instructions : (1) Answer *any* **five** questions.

(2) Each question carries **ten** marks.

(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. A 15-mm diameter steel rod passes centrally through a copper tube 30 mm external diameter and 20 mm internal diameter. The composite bar is rigidly joined at both the ends. If the temperature of the assembly is raised by 100 °C, calculate the stresses developed in steel and copper.

Take, E_s 2 10 N/mm^2; E_c 1 05 10^5 N/mm^2

$_s$ 12 10 ^{6}/°C; $_c$ 17 5 10 ^{6}/°C

12. Briefly explain any five mechanical properties of engineering materials.

13. The following data refers to a tensile test :

(i) Diameter of steel bar = 300 mm

(ii) Gauge length = 200 mm

(iii) Extension at a load of 100 kN = 0·139 mm

(iv) Load at elastic limit = 200 kN

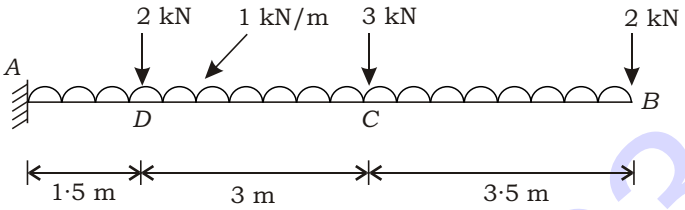
Calculate—

(a) resilience;

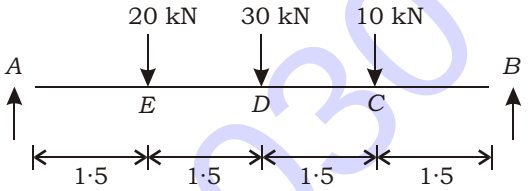
(b) proof resilience;

(c) modulus of resilience.

14. A cantilever beam of length 8 m is subjected to the load as shown in the figure given below. Draw the shear force and bending moment diagrams :



15. Draw the shear force and bending moment diagrams for the simply supported beam as shown in the figure given below :



16. A circular pipe having 80 mm external diameter and 10 mm thick is used as a freely supported beam over a span of 4 m. Find the maximum load that can be applied at the centre of the beam, if the permissible stress is not to exceed 125 N/mm^2.

17. *(a)* Draw a neat sketch of leaf spring and mention the various parts.

(b) Define the following :

(i) Spring stiffness

(ii) Spring index

18. *(a)* State the assumptions made in torsion equation.

(b) A cylindrical steel shell 500 mm in diameter with a wall thickness of 10 mm is subjected to an internal pressure of 3·5 N/mm^2. Calculate the hoop stress and shear stress induced in the shell material.

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