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C09–M–403

3503

BOARD DIPLOMA EXAMINATION, (C–09)

MARCH/APRIL—2018

DME—FOURTH SEMESTER EXAMINATION

STRENGTH OF MATERIALS

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

PART—A 3×10=30

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

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

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

1. Calculate the modulus of rigidity of a cylindrical bar having Poisson's ratio 0·25 and modulus of elasticity 1 10^5 N/mm^2.

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. A thin cylindrical shell having 2·2 m diameter and 5 m length is subjected to a hoop stress of 65 N/mm^2. Calculate the circumferential strain. Assume Poisson's ratio as 0·32 and Young's modulus as 2 1 10^5 N/mm^2.

4. Define *(a)* bending moment and *(b)* shear force.

5. Define the following terms :

(a) Reactions

(b) Point of contraflexure

6. Define the following terms :

(a) Bending stress

(b) Section modulus

7. A steel strip of 10 mm thick is bent round a circular drum of 3 m diameter. Calculate the maximum stress developed in the strip. Take E for steel 200 kN/mm^2.

8. State the assumption made in deriving torsion equation.

9. Find the torque transmitted by a circular shaft of 50 mm diameter at 250 r.p.m. The maximum shear stress in the shaft is not to exceed 55 N/mm^2.

10. Write down the expressions for three types of strains induced in a thin cylindrical shell when it subjected to internal pressure.

PART—B 10×5=50

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 cylindrical bar is 25 mm diameter of 1·25 m long. During a tensile test, it was found that the linear strain is 4 times the lateral strain. Calculate the shear modulus, bulk modulus, if the bar is elongated by 0·06 mm under an axial load of 50 kN. Also find the change in volume, when the bar is subjected to a hydrostatic pressure of 100 N/mm^2.

12. A 15 m diameter steel rod passes centrally through a copper tube 30 mm external diameter and 20 mm internal diameter. The composite bar is rigidly jointed 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

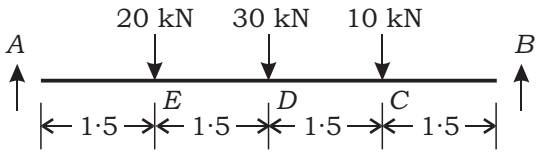
13. Derive the expression for the stresses due to following loads :

(a) Gradually applied load

(b) Suddenly applied load

14. With usual notations and sign convention, draw the shear force and bending moment diagrams of A cantilever beam with uniformly distributed load for the second-half of its length.

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



16. A cantilever beam of 3 meter long carries two point loads 30 kN and 20 kN, one at 2 m from fixed end and the other at free end respectively. Find the deflection at free ends. Take E 2 10^5 N/mm^2 and I 2 10^8 mm^4.

17. A carriage spring 1 m long is required to carry a central load of 9 kN, of the central deflection is not to exceed 18 mm and the maximum stress is 150 N/mm^2. Determine the thickness, width and number of plates. Take width of plate is 10 times the thickness and E 2 10 N/mm^2.

18. *(a)* Write the torsion equation and specify the terms in it.

(b) Derive expression for hoop stress when a seamed type thin cylinder is subjected to an internal fluid pressure.

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