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C09–M–403

3503

BOARD DIPLOMA EXAMINATION, (C–09)

OCT/NOV—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. Define the following terms :

(a) Modulus of elasticity

(b) Modulus of rigidity

(c) Bulk modulus

2. A steel rod 25 mm diameter is subjected to an axial pull of 50 kN. Determine the elongation of the rod over a gauge length of 600 mm, if $E \quad 2 \quad 10^5 \, N / mm^2$.

3. Define the following terms :

(a) Resilience

(b) Proof resilience

(c) Modulus of resilience

4. List five types of beam.

5. A simply supported beam of length 6 m carries a load of 3 kN at its centre. Draw shear force and bending moment diagrams.

6. Write bending equation and mention the units of the terms.

7. Write an expression for maximum slope and deflection of cantilever beam with uniformly distributed load of w kN/m on entire span.

8. Write any three assumptions which are made in deriving the torsion equation.

9. Define the following terms :

   (a) Spring index

   (b) Spring stiffness

10. A thin cylindrical shell of internal diameter 2 m contains a fluid at an internal pressure of 4 N/mm^2. Determine the safe thickness of the cylinder if the maximum stress is not to exceed 50 N/mm^2.

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. Define the following :

   (a) Stress

   (b) Strain

   (c) Malleability

   (d) Ductility

   (e) Toughness

12. A bar of 350 mm long is 50 mm diameter for 130 mm of its length; 20 mm diameter for the next 120 mm length and 30 mm diameter for the remaining length. It is subjected to a tensile load of 150 kN. Calculate the stress in each section and the total elongation of the bar. Take E 2 10^5 N/mm^2.

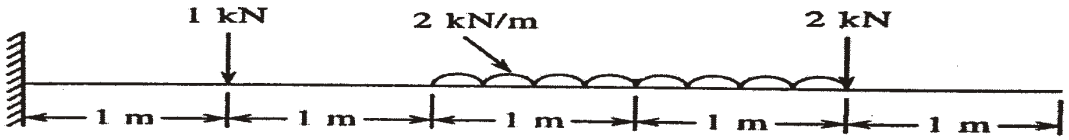
13. Derive the expression for the maximum instantaneous stress for the following conditions :

(a) A load of P falls vertically on to the collar attached to the lower end from the height of h 5

(b) A load of P falls suddenly without impact 3

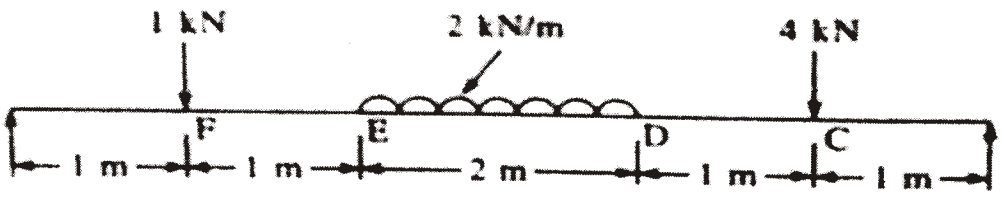
(c) A load of P falls gradually 2

14. Draw shear force and bending moment diagrams for the cantilever beam loaded as shown in the below figure :



15. A rectangular beam of simply supported of span 5 m, is carrying uniformly distributed load of 45 kN/m. Depth of the beam is 2·5 times the width. Determine the dimensions of the beam if the maximum stress in the material should be 80 N / mm^2.

16. Draw shear force and bending moment diagrams for a simply supported beam loaded as shown in below figure. Clearly mark the position of the maximum bending moment and determine its value :



17. Determine the diameter of solid shaft to transmit 500 kW of power at 120 RPM. The maximum torque is 20% greater than the mean torque. The allowable shear stress should not exceed 60 N/mm^2 and angle of twist in 4 m should not exceed 1°. Take, G 0 8 10^5 N/mm^2.

18. *(a)* A close-coiled helical spring made of 6 mm diameter steel wire has 15 coils of 80 mm mean diameter. The spring is subjected to an axial load of 100 N. Calculate—

(i) the maximum stress induced;

(ii) the deflection;

(iii) stiffness of the spring.

Take, G 0 8 10^5 N/mm^2. 5

(b) A cylindrical boiler shell is made of 15 mm thick plate. The diameter of the shell is 2 m and length is 4 m. Determine the change in the dimensions of the shell and volume for a steam pressure of 1 N/mm^2. Take, E 2 10^5 N/mm^2 and Poisson's ratio as 0·3. 5

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