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C09–M–403

3503

BOARD DIPLOMA EXAMINATION, (C–09)

MARCH/APRIL—2017

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) Answer 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 ratio 0·25 and modulus of elasticity 1 10^5 N/mm^2.

2. A rod of 32 m long is rigidly fixed at a temperature of 20 °C. Find the stress induced in the rod if the temperature is raised to 90 °C. [Take, E 1 10^5 N / mm^2 and $_s$ 1 2 10 ^{6}/ C].

3. Define the following :

(a) Resilience

(b) Proof resilience

(c) Modulus of resilience

4. A cantilever beam of 5 m long carries a point load of 4 kN at 3 m from fixed end. Draw the shear force and bending moment diagrams.

5. Define the following terms :

   (a) Reactions

   (b) Point of contraflexure

6. A cantilever beam of length 3 m carries point load at free end. If the maximum slope is 0·01 radians, calculate the deflection at free end.

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. A close coiled helical spring of 20 coils has a wire diameter of 5 mm and mean coil diameter of 30 mm. Find the stiffness of spring. [Take, G 8 4 10^4 N/mm^2]

9. A hollow circular shaft is having 50 mm external diameter and 35 mm internal diameter. Determine the polar moment of inertia of the shaft.

10. A thin cylindrical shell of 1000 mm diameter is pressurised to 12 bar. If the maximum stress in the shell is not to exceed 60 N / mm^2, calculate the minimum thickness of the shell required.

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. Discuss the behaviour of a mild steel specimen when subjected to a tensile test.

12. A reinforced concrete column 300 mm × 300 mm in section is provided with 8 steel bars of 200 mm diameter. The column carries a compressive load of 600 kN. Find the load shared by each material. Modular ratio of steel to concrete is 18.

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

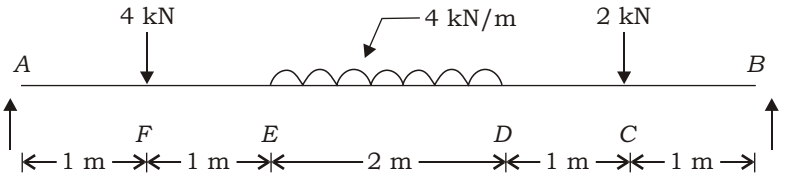
Calculate the following :

(a) Resilience

(b) Proof resilience

(c) Modulus of resilience

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



15. Explain the following with sketches :

(a) Types of beam

(b) Types of load

16. Derive the bending equation with usual notations.

17. A hollow shaft with external diameter 150 mm and internal diameter 100 mm is used to transmit power. While transmitting power, it is found that the angle of twist of 1·5° over a length of 2 m. Find *(a)* the power transmitting at 300 r.p.m. and *(b)* the maximum shear stress induced.

[Take, modulus of rigidity as 0 8 10^5 N / mm^2]

18. *(a)* A close-coiled helical spring of 100 mm mean diameter is made of 10 mm diameter rod and has 18 turns. The spring carries an axial load of 190 N. Determine the *(i)* shear stress and *(ii)* deflection when carrying this load. [Assume G 0 8 10^5 N / mm^2]

(b) A 8-mm thick cylindrical shell having 2·2 m diameter and 5 m length is subjected to a fluid pressure of 3 N / mm^2. Calculate volumetric strain. [Assume Poisson ratio as 0·3 and Young's modulus as 2 1 10^5 N / mm^2]

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