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C09–M–403

3503

BOARD DIPLOMA EXAMINATION, (C–09)

OCT/NOV—2015

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 elastic constants :

(a) Bulk modulus

(b) Rigidity modulus

2. A steel rod 3 m long is fixed rigidly at the ends and heated through a temperature of 800 °C. Find the prevented expansion, take $_s$ as 12 10 ^{6}/°C.

3. A 12 mm diameter MS bar of length 1·25 m hangs vertically, a weight of 150 N dropping freely through 15 mm before commencing to stretch the bar. Find the maximum instantaneous stress. Take E 2 10^5 N/mm^2.

4. List any three types of beams.

5. Define the following terms :

(a) Reactions

(b) Point of contraflexure

6. Define the terms, neutral layer and layer of maximum stress.

7. A simply supported beam of length 5 m carries a uniformly distributed load of 4 kN-m over the entire span. Find the maximum deflection. Take flexural rigidity of the beam as 48 10^8 kN-mm^2

8. A solid circular shaft is transmitting 1·5 kN-m torque at 1440 r.p.m. Find the power transmitted by it.

9. State the function of a spring. List suitable materials for springs.

10. A 10 mm thin cylindrical shell having 1·5 m diameter and 5 m long is subjected to a fluid pressure of 3 N/mm^2. Calculate longitudinal stress and hoop stress.

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. Write short notes on the following five mechanical properties of materials :

(a) Modulus of elasticity

(b) Ductility

(c) Malleability

(d) Brittleness

(e) Hardness

12. A ferro-concrete column of 300 mm×300 mm square section is reinforced with steel reinforcement, the area being 1% of column area. The column carries a compressive load of 600 kN. Find load shared by concrete and steel. Modular ratio of steel to concrete is 15.

13. A mild steel bar of length 3 m and diameter of 50 mm hangs vertically and a load of 200 kN falls on a collar attached to the lower end. Find the maximum stress, when—

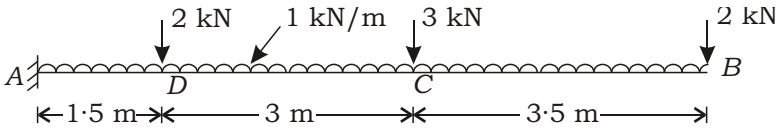
(a) height of fall is 150 mm;

(b) load is applied suddenly without impact;

(c) load is applied gradually.

Take E 2 10^5 N/mm^2.

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



15. A simply supported beam of span 8 m carries a UDL of 20 kN/m up to a distance of 4 m from left support and a point load of 40 kN at distance of 2 m from right support. Draw shear force and bending moment diagrams.

16. A simply supported beam is 200 mm×350 mm in section and 6 m long. If the permissible bending stress is 100 N/mm^2, find the—

(a) point load that can be applied at the centre of the beam;

(b) uniformly distributed load that can be applied on the entire span.

17. A wagon weighting 50 kN is moving at 10 kmph. How many springs each of 18 coils will be required, in a buffer stop to absorb the energy of motion with a compression of 250 mm? The mean diameter of coil is 200 mm and wire diameter is 20 mm. Take G 0·9 10^5 N/mm^2.

18. *(a)* Draw a neat sketch of a helical spring and show the following :

(i) Mean diameter

(ii) Wire diameter

(iii) Outside diameter

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

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