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C14–M–305

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BOARD DIPLOMA EXAMINATION, (C–14)

OCT/NOV—2017

DME—THIRD 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. List out three elastic constants and write down the relation between them.

2. A steel bar 300 mm long and diameter 20 mm is subjected an axial pull of 300 kN. Determine the volumetric strain.

[Take E 2 10^5 N / mm^2 and m 4]

3. A mild steel of 20 mm diameter and 70 mm gauge length is subjected a sudden axial pull of 50 kN. Calculate the maximum stress and elongation. Take E 200 GPa.

4. Draw shear force and bending moment of cantilever beam with uniformly distributed load of entire span.

5. List out the types of beams.

6. Write the assumptions made in theory of simple bending.

7. Find the maximum stress induced in a rectangular beam of width 60 mm an depth 160 mm when bending moment of 600 Nm is applied.

8. A closely coiled helical spring of 20 coils has a wire diameter of 4 mm and mean coil diameter of 30 mm. Find the stiffness of the spring.

[Take G 8 4 10^4 N / mm^2].

9. A solid shaft of 20 mm diameter transmits power at 750 r.p.m. the maximum shear stress in the shaft is 80 N / mm^2. Determine the power transmitted by the shaft.

10. Derive an expression for hoop stress on thin cylindrical shell.

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 short column of 350 mm × 350 mm section is to consists of concrete reinforced with steel rods of 20 mm diameter with compressive load of 3 MN. How many reinforcing steel rods are required if stress in concrete s not to exceed 17·5 N / mm^2 and E_s 10 times that of concrete.

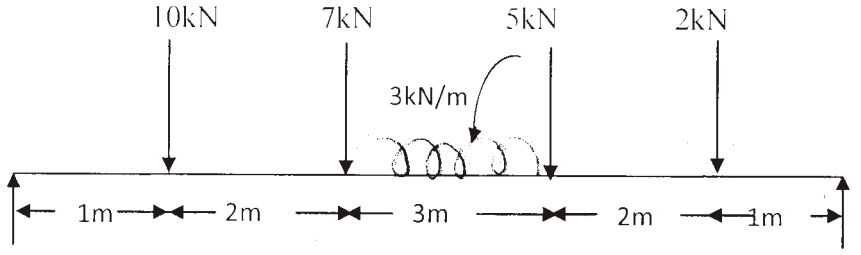
12. A steel bar of length 2 m and has a diameter of 50 mm hangs vertically. A load of 20 kN falls on collars attached to the lower end. Find maximum stress when—

(a) height of falls is 150 mm;

(b) load suddenly applied without impact;

(c) load is gradually applied.

13. A cylindrical shall 1 m long, 150 mm internal diameter having thickness of metal as 10 mm is filled with fluid at atmospheric pressure. If an additional 15 cm^3 at fluid is pumped into the cylinder, find the pressure exerted by the fluid on the cylinder and corresponding loop stress induced.



14. Draw shear force and bending moment diagram of a given simply supported beam.

15. A beam of length of 5 m. It has an inverted *T*-section with 100 mm × 20 mm flange and 100 mm × 20 mm web. It is simply supported at the ends and carries a uniformly distributed load of 2 kN/m. Calculate the maximum tensile and compressive stress.

16. A cantilever beam of 2 m long is loaded with point load of 800 N at the free end and distributed load of 3 kN/m over 1·2 m from the fixed end. If the section of rectangular is 75 mm × 150 mm deep. Calculate the slope and deflection at the free end.

[E 1 1 10^5 N / mm^2]

17. *(a)* Derive an equation of

$$\frac{T}{J} \quad \frac{G}{l} \quad \frac{}{R}$$

(b) A solid shaft is to transmit 75 kW at 200 RPM. Taking allowable shear stress is 75 N / mm^2. Find suitable diameter of the shaft if maximum torque is 35% of greater than the mean torque.

18. A wagon weighting 40 kN moving at 12 kmph. How many springs each of 20 coils will be required in a buffer stop to absorb the energy of motion during a compression of 300 mm and wire diameter 30 mm.

[Take G 0 8 10^5 N / mm^2]

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