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C16–M–302

6243

BOARD DIPLOMA EXAMINATION, (C–16)

OCT/NOV—2018

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. Explain:

(a) Ductility

(b) Malleability

2. A bar of 25 mm diameter is subjected to a pull of 50 kN. The measured extension over a gauge length of 200 mm is 0.1 mm and change in diameter is 0.0035 mm. Find the Poisson's ratio and bulk modulus.

3. A wrought iron bar of 50 mm diameter and 2.5 m long has to transmit a shock energy of 100 Nm. Calculate the maximum instantaneous stress. Take E 200 GN / m^2.

4. A water main 80 cm diameter contains water at a pressure head of 100m. If the weight density of water is 9810 N/m^3, find the thickness of the metal required for the water main. Given the permissible stress as 20 N/mm^2.

5. Define beam. Write any three types of beams.

6. Define:

(a) Neutral axis

(b) Section Modulus.

7. Write an expression for slope and deflection of a cantilever beam with a point load at free end.

8. State the assumptions made in single torsion equation.

9. A circular shaft of diameter 50 mm transmits 1500 N-m torque. Find the shear stress induced in it.

10. List any three applications of springs.

PART—B

5×10=50

Instructions : (1) Answer *any* **five** questions.

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

(3) The answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

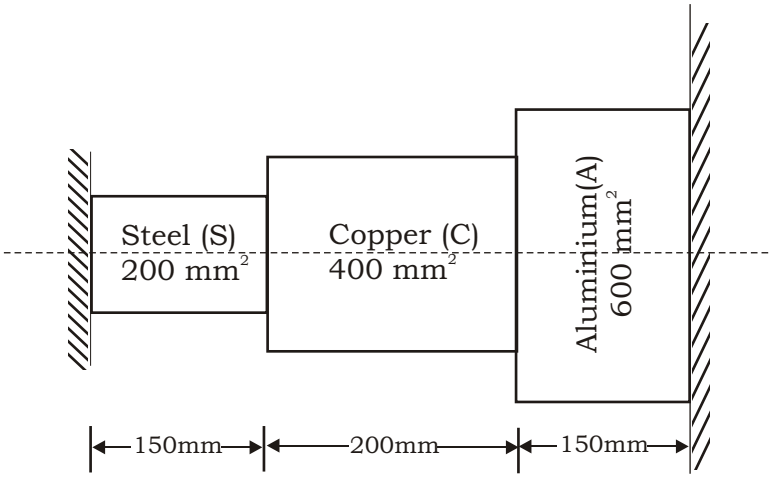
11. A rod composed of three segments as shown in fig. below. The rod is held between rigid supports. Find the stress developed in each material, when the temperature of the system is raised by 50°C under the following two different conditions—

(a) when the supports are perfectly rigid;

(b) when the right hand supports yields by 0.2 mm.

Take E_S= 200 GPa; take E_c= 100 GPa; E_A= 90 GPa;

$_S$ 12 10 ^{6}/ C; $_C$ 16 10 ^{6}/ C; $_A$ 20 10 ^{6}/ C;



12. A wagon weighing 30 kN is attached to a wire rope and is moving down on an incline at a speed of 70 cm/s, when the length of rope unwound is 30m, it gets jammed and the wagon is suddenly brought to rest. Calculate the maximum instantaneous stress and maximum instantaneous elongation produced if the diameter of the rope is 4 cm.

Take E 2.05 10^5N / mm^2 and g 9.81 m / s^2.

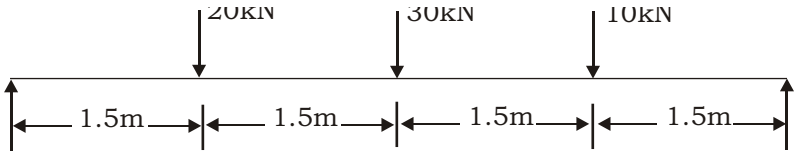
13. A cylindrical drum of 800 mm diameter, 3 m long has a shell thickness of 10 mm. If the drum is subjected to an internal pressure of 2.5 N / mm^2, determine—

(a) change in diameter;

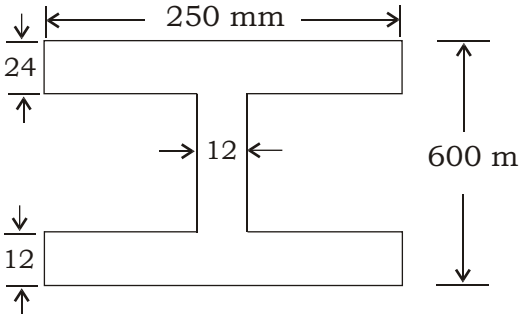
(b) change in length;

(c) change in column.
Take E 2 10^5N / mm^2; Poisson's ratio=0.25.

14. Draw the shear force and bending moment diagrams for the simple supported beam as shown in fig below.



15. A beam of I-section as shown in figure below. The beam is simply supported over span of 10 m and carriers a u.d.l. of 50 kN/m km run over the entire span. Calculate the maximum stress produced due to bending.



16. A cantilever beam of length 3 m carries UDL of 2 kN/m over a length of 1.5 m from fixed end and a point load of 1 kN at free end. If the section is 80 mm × 120 mm deep, calculate the slope and deflection at free end. Take E 2 10^5 N / mm^2.

17. A hollow shaft having an internal diameter 40% of its external diameter transmits 562.4 kW power at 1000 rpm. Determine the external diameter of the shaft if the shear stress is not to exceed 60 N / mm^2 and the twist in a length of 2.5 m should not exceed 1.3°. Assume maximum torque equal to 1.25 mean torque and G 9 10^4 N / mm^2.

18. A laminated spring 1 m long is made up of plates each 50 mm wide and 10 mm thick. If the bending stress is limited to 120 N / mm^2. How many plates will be required to enable the spring to carry in central point load of 2500 N.? If E 2.13 $10^5 N / mm^2$. What is the deflection under given load?

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