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C16–M–302

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BOARD DIPLOMA EXAMINATION, (C–16)

OCT/NOV—2017

DME—THIRD SEMESTER EXAMINATION

STRENGTH OF MATERIALS

Time : 3 hours] [*Total Marks* : 80

PART—A 10×3=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 *(a)* ultimate strength and *(b)* factor of safety.

2. A steel bar of 200 mm long is placed between two supports with an end clearance of 0·3 mm. Its temperature is then raised by 200 °C. What will be the stress in the bar? For steel E_s 200 GN/m^2 and $_s$ 12 10 ^{6} per °C.

3. A bar of 35 mm diameter and 2 m long is subjected to a sudden load of 50 kN. Calculate the maximum instantaneous streas and strain energy in the bar. Asssume E 2 10^5 N/mm^2.

4. A thin cylinder of internal diameter 2 m contains a fluid at an internal pressure of 3 N/mm^2. Determine the maximum thickness of the cylinder if (a) the longitudinal stress is not to exceed 30 N/mm^2, and (b) the circumferential stress is not to exceed 40 N/mm^2.

5. Draw shear force and bending moment diagram for a simply supported beam of length 6 m and carries a point load of 40 kN at a distance of 1·75 m from left end support.

6. State any three assumptions made in the theory of simple bending.

7. A cantilever beam of length 6 m is carrying a UDL 16 kN/m. Calculate the maximum deflection at the free end, if moment of inertia is 95 10^7 mm^4. Take E 2 10^5 N/mm^2.

8. State the functions of shaft. List suitable materials for shafts.

9. Find the maximum torque transmitted by a hollow circular shaft of external diameter 30 cm and internal diameter 15 cm, if the shear stress is not to exceed 40 N/mm^2.

10. Define the terms spring index and stiffness related to coiled helical springs.

PART—B

10×5=50

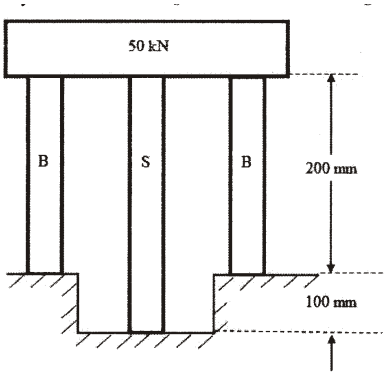
Instructions : (1) Answer *any* **five** questions.

(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 steel rod of cross sectional area 1600 mm^2 and two brass rods each of cross-sectional area of 1000 mm^2 together support a load of 50 kN as shown in figure below. Find the stresses in the rods and the load shared by each rod.

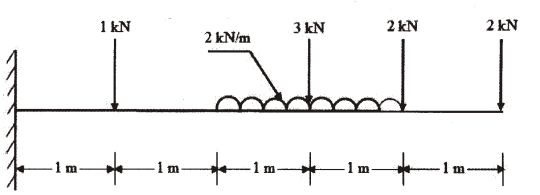
Take E_S 2 10^5 N/mm^2 and E_B 1 10^5 N/mm^2.



12. A MS bar of length 2 m has a diameter of 50 mm, hangs vertically. A load of 20 kN falls on a collar attached to the lower end. Find the maximum stress when *(a)* heigh of fall is 100 mm, *(b)* load is applied suddenly without impact, and *(c)* when load is applied gradually. Take E 2 10^5 N/mm^2.

13. A cylindrical shell 2·5 m long which is closed at the ends, has an internal diameter of 0·9 m and a wall thickness of 10 mm. Calculate the circumferential and longitudinal stresses induced and also change in the dimensions of the shell. if it is subjected to an internal pressuer of 1 N/mm^2. Take E 2 10^5 N/mm^2 and Poisson's ratio as 0·3.

14. Draw shear fore diagram and bending moment diagram for the beam loaded as shown in figure below.



15. A simply supported timber beam of rectangular cross section is to be support as a load of 25 kN uniformly distributed over a span of 3·6 m. If the depth of the section is to be twice the breadth, and the stress in timber is not exceed 7 N/mm^2, find the dimensions of the cross section.

16. A simply supported beam of circular cross-section is 5 m long and is of 150 mm diameter. What will be the maximum value of the central load if the deflection of the beam does not exceed 12·45 mm? Also calculate the slope at the supports.

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

17. A ship propeller shaft is to transmit 500 MW at 2 rev/sec. The shaft permissible stress is limited to 60 N/mm^2 and the maximum torque being 1·3 times the mean torque. Determine (a) required diameter if a solid shaft is used and (b) the internal and external diameter of hollow shaft if their ratio is 3:4.

18. A closely coiled helical spring made of 10 mm diameter steel wire has 15 coils of 100 mm mean diameter. The spring is subjected to an axial load of 150 N. Calculate *(a)* the maximum shear stress induced, *(b)* the deflection and *(c)* stiffness of the spring.

Take G 8 16 10^4 N/mm^2.

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