C16-**M-302**

6243

BOARD DIPLOMA EXAMINATIONS

OCT/NOV-2019

DME – THIRD SEMESTER

STRENGTH OF MATERIALS

Time: 3 hours Max. Marks: 80

PART – A **3 X 10 = 30**

Instructions: *1. Answer **all** questions.*
*2. Each question carries **Three** Marks.*
3. Answer should be brief and straight to the point and should not exceed Five simple sentences.

1. Define stress and strain. Write down their Units in SI system.
2. Define Factor of safety. Significance of Factor of Safety.
3. Derive an expression for the strain energy of a uniform bar in tension.
4. Define the following a) Hoop stress and b) Longitudinal Stress
5. Draw S.F and B.M diagram for simply supported beam with a point load at centre.
6. State any three assumptions made in theory of simple bending.
7. A cantilever beam 2.5 m carries a point load of 30 KN at free end. Find the slope and deflection of the beam at the free end. Assume I = 8 x 10^7 mm^4. E= 2.1 x 10^5 N/mm^2.

8. A solid circular shaft of diameter 40 mm transmits 1500 N-m torque. Find the shear stress induced in it.

9. Define the term polar modulus of a section.

10. Define a spring. List any three applications of springs.

PART – B **5 X 10 = 50**

Instructions: *1. Answer any **Five** questions*
*2. Each question carries **TEN** Marks.*
3. Answer should be comprehensive and a criterion for valuation is the content but not the length of the answer.

11. A bar of length 3 m has a diameter of 50 mm over half its length and a diameter of 25 mm over the other half. If E= 2.06 x 10^5 N/mm^2 and the bar is subjected to a pull of 50 kN. Find the stress in each section and total extension of the bar.

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
i) Height of fall is 100 mm.
ii) Load is applied suddenly without impact.
iii) When the load is applied gradually.
Take E= 2 x 10^5 N/mm^2

13. A cylindrical shell is 3 m long, 0.75 m internal diameter and 12.5 mm thick at atmospheric pressure. Calculate the new dimensions when the shell is subjected to an internal pressure of 1.5 N/mm^2. What is the maximum shear stress in the shell Assume E= 2.1 x 10^5 N/mm^2 and poison's ratio as 0.25.

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14. A cantilever beam of length 2m carries an uniformly distributed load of 3 kN/m over a length of 1.5 m from its fixed end and a point load 5 kN at its free end. Draw the shear force and bending moment diagram.

15. a) A rectangular beam 300 mm deep is simply supported over a span of 4 meters. What uniformly distributed load per meter the beam may carry if the bending stress is not to exceed 120 N/mm^2.
Take $I = 8x10^6 mm^4$.

b) A cantilever is of circular section of diameter 100 mm. If the length of cantilever is 0.9 m. Find the point load which it can carry at its free end the maximum bending stress is not to exceed 50 Mpa.

16. a) A timber beam, 150 mm x 300 mm cross section supports a central point load on a span of 4 m. If the maximum bending stress is 8 N/mm^2, what is the maximum deflection? Take $E= 0.1 \times 10^5 N/mm^2$.

b) A cantilever 1.25 m long of section 100 mm wide x 160 mm deep carries a concentrated load of 60 kN at free end. Find the deflection at free end. Take $E= 2.1 \times 10^5 N/mm^2$

17. A hollow shaft is to transmit 300 kW at 90 rpm. If the shear stress must not exceed 60 N/mm^2, find the external and internal diameters of shaft. Assume that the maximum torque is 20 % greater than the mean torque and internal diameter is 0.6 times of the external diameter.

18. A Close – coiled helical spring made of 6mm diameter steel wire has 20 coils, each of 100 mm mean diameter, when it is subjected to an axial load of 70 N. Take $G= 8.4 \times 10^4 N/mm^2$.

Calculate i) The maximum shear stress produced.
ii) The deflection of the spring
iii) Stiffness of the spring.