6243
BOARD DIPLOMA EXAMINATION
JUNE - 2019
DIPLOMA IN MECHANICAL ENGINEERING
STRENGTH OF MATERIALS
THIRD SEMESTER EXAMINATION

Time: 3 Hours **Total Marks: 80**

PART - A (3m x 10 = 30m)

Note 1:Answer all questions and each question carries 3 marks

2:Answers should be brief and straight to the point and shall not exceed 5 simple sentences

1. What are the effects of Tensile, Compressive and shear Forces
2. What are the factors to be considered in selecting the value of factor of safety?
3. A circular rod of diameter 10 mm is subjected to a load of 800 N. Find the instantaneous stress in the rod when the load is applied gradually.
4. A cylindrical steel shell 600 mm in diameter with a wall thickness of 12 mm is subjected to an internal pressure. If the allowable tensile stress is 50 MPa, find the maximum pressure to which the shell can be subjected
5. A cantilever beam of length 2 m is subjected to a point load at its midpoint. Find the max shear force and bending moment in the beam
6. Draw the distribution of bending stress along the depth of hollow rectangular section
7. Find the maximum deflection of 4 m long simply supported beam of rectangular section of 40 mm x 20 mm when it is subjected to midpoint load of 800 N. Take E = 200 GPa
8. Draw the distribution of shear stress along the radius of hollow circular section
9. Define Polar Section modulus and write its units
10. A closed coil helical spring made of steel wire of diameter 6 mm having a mean coil diameter of 80 mm is subjected to an axial load of 150 N. Find the maximum shear stress developed in the material of spring

PART - B (10m x 5 = 50m)

Note 1:Answer any five questions and each question carries 10 marks

2:The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer

11. A mild steel rod ABC of circular section transmits an axial pull. The total length is 135 cm, AB is 75 cm long and BC 60 cm long. AB is 22 mm diameter and BC is 18 mm diameter. If the total change in length is 0.7 mm, determine for the separate parts AB and BC the changes in (a) length, (b) diameter and (c) volume. Take Poisson's ratio as 0.3, Young's Modulus as 2.0 x 10^5N/mm^2

12. A bar 3 m long and 5 cm in diameter hangs vertically and has a collar attached to it at its lower end. Find the maximum instantaneous stress induced in the bar when,
    (a) a mass of 200 kg falls by 100 mm on the collar
    (b) a mass of 2000 kg falls by 10 mm on the collar. Take E = 200 GPa.

13. A thin cylindrical shell of 160 mm internal diameter, 12 mm thick and 1 m long is filled with water at atmosphearic pressure. If an additional amount of 20 cm^3 of water is pumped into the cylinder find the pressure exerted by water on the cylinder. Assume the water as incompressible.

14. A simply supported beam of length 3 m is subjected to a UDL of intensity 500 N/m over a length of 1 m starting from the left support and a concentrated load of 1500 N at a distance of 1 m from the right support. Draw the shear force and bending moment diagrams for the beam

15. A cantilever beam is subjected to a uniform sagging bending moment of 800 N.m. The cross-section of the beam is an equilateral triangle with a side length of 50 mm. Find the max bending stress in the beam and draw the distribution of bending stress across the depth of the beam

16. By using the super position principle find the maximum deflection and slope of a cantilever beam of length 4 m when it is subjected to two point loads of 700 N and 400 N at 1 m from the fixed end and at the free end respectively. The cross-section of the beam is a rectangle with the dimensions 100 mm X 50 mm. Take E = 200 GP0061

17. A 1.5 m long solid aluminium shaft with a 60 mm diameter is to be replaced by a steel hollow shaft of the same length and same external diameter to transmit same torque with same angle of twist over the same length. Determine the inside dimeter of the hollow shaft. Take G_s = 82 GPa, G_a = 27 GPa

18. A Wagon weighing 35 kN moves at a speed of 3.6km/h. Find the number of springs required in a buffer stop to absorb the energy of motion during a compression of 180 mm. The mean diameter of coils is 220 mm and the diameter of the steel rod of the spring is 24 mm. Each spring consists of 30 coils. Take G = 90 GPa