6243
BOARD DIPLOMA EXAMINATION
MARCH/APRIL - 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. Define Elastic Limit, Yield Point and Ultimate Stress
2. State the Hook's Law
3. A circular rod of diameter 10 mm and length 1 m is subjected to a load of 500 N. Find the strain energy in the rod. Take E= 2 x 10^5 N/mm^2.
4. Find the diameter of a thin cylindrical shell of thickness 10 mm which is subjected to a fluid pressure of 1.5 MPa. Take the allowable tensile stress of the shell material as 50 MPa.
5. Draw the Shear force diagram for a Simply supported beam subjected to UDL throughout its length
6. Write the equation for the section modulus of solid and hollow circular sections in usual notations
7. Find the maximum deflection of 3 m long cantilever beam of rectangular section of 40 mm x 20 mm when it is subjected to end point load of 800 N. Take E = 200 GPa
8. Draw the distribution of shear stress along the radius of hollow circular section
9. Find the torque transmitted by the circular shaft if it is transmitting a power of 25 kW at 420 rpm
10. Write the nomenclature of a closed coil helical spring

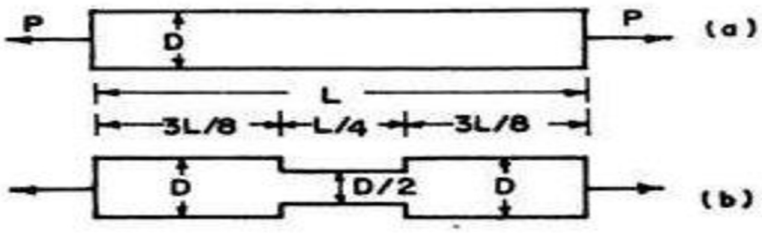
PART - B (10m x 5 = 50m)

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 bar of 25 mm diameter is subjected to a pull of 40 kN. The measured extension on gauge length of 200 mm is 0.085 mm and the change in diameter is 0.003 mm. Calculate all the three elastic constants.

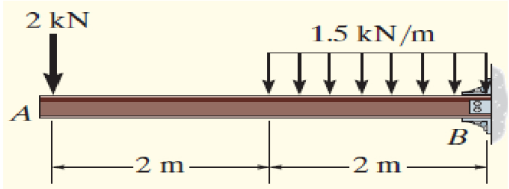
12. Two bars, each of length L and of different materials are each subjected to the same tensile force P. The first bar has a uniform diameter D and the second bar has a diameter D/2 for a length L/4 at the middle and a diameter D for the remaining length. Compare the



strain energies of the two bars if the ratio of their modulus of elasticities is 4/7 ($E_1/E_2 = 4/7$).

13. Derive the expressions for circumferential and longitudinal stresses in a thin cylindrical shell subjected to internal pressure with legible sketches.

14. Draw the shear force and bending moment diagrams for the cantilever beam shown in the fig.



15. A cantilever beam of length 2 m is subjected to a UDL of intensity 1000 N/m throughout its length. Find the max bending stress in the beam if the cross-section of the beam is rectangle with dimensions 80 mm X 40 mm. Also draw the distribution of bending stress across the depth of the beam

16. A simply supported steel beam of length 2 m is subjected to a midpoint load of 1000 N and a UDL of 100 N/m. By using the superposition principle find the maximum slope and deflections of the beam. The cross-section of the beam is a rectangle of 120mm x 80 mm and E = 210 GPa

17. 01. A shaft transmits 280 kW of power at 160 rpm. Determine,
    (a) the diameter of a solid shaft to transmit the required power
    (b) the inner and outer diameters of a hollow shaft if the ratio of the inner and outer diameters is 2/3
    (c) the percentage saving in the material on using a hollow shaft instead of a solid shaft

    Take the allowable shear stress as 80 MPa and the weight density of the material as 78 kN/m^3

18. A close-coiled helical spring has a maximum load of 40 N and maximum shear stress induced is 100 MPa. The spring constant is 600 N/m in compression. If the solid length of the spring is 60 mm, determine the wire diameter, number of coils and coil diameter. Take G = 32 GPa

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