7. Determine the stress at the inner radius due to centrifugal force in a rotor having an outer radius of 66 cm with a radius of 10 cm for the inner hole. The rotor is cut by slots 26 cm deep at its periphery for winding which has the same mass as the mass of material removed. The rotor revolves at 1800 r.p.m. Take $\mu = 0.3$, $\rho = 7500$ kg/m^3. 20

SECTION – D

8. Derive an expression for deflection of the simple chain link due to bending. 20

9. An open coiled helical spring is having 10 coils, mean diameter 40 mm and wire diameter 5 mm. The helix angle is 25°. The axial deflection due to axial is 10mm. Determine the axial load. Also find bending stress and shear stress due to this axial load. Determine the value of axial twist due to which a bending stress produced is 50 M/mm^2. Take $E = 2.1 \times 10^5$ N/mm^2 and $G = 0.84 \times 10^5$ N/mm^2. 20

Roll No. .....

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B. Tech. 7th Sem. (ME) Examination – June, 2016

STRENGTH OF MATERIAL - II

Paper : ME-401-F

Time : Three Hours] *[Maximum Marks : 100*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in total, at least *one* question from each Section. Question No. 1 is ***compulsory***. All questions carry equal marks.

1. Explain the following : 20
   (a) Flat spiral spring
   (b) Hoop and Longitudinal stresses in cylindrical vessels
   (c) Wire wound cylinders

(d) Castigliano's theorems

(e) Strain Energy

(f) Stresses in crane hooks

(g) Theories in Elastic Failure

(h) Ellipse of inertia

(i) Stresses in uniform rotating discs

(j) Bending in curved bars

SECTION – A

2. A 10 mm diameter mild steel bar of length 1.50 m is stressed by a weight of 120 N dropped freely through 20 mm before commencing to stretch the bar. Find the maximum instantaneous stress and the elongation produced in the bar. Take $E = 2 \times 10^5$ N/mm². 20

3. A solid circular shaft is loaded to a twisting moment of 60 kN-m and a bending moment of 30 kN-m. Determine the diameter of shaft on the basis of total strain energy per unit volume is not to exceed in that material under a pure shear stress of 30 Mpa. Take E = 200 GPa and $\mu = 0.3$. 20

SECTION – B

4. A steel pipe of 250 mm in diameter and 6 mm thick is subjected to a pressure of 3 MPa. Calculate the hoop stress in the pipe due to 3 MPa inside pressure and also when wound before stressing with wire of 3 mm diameter. The wire carries a tension of 70 N/mm². Determine the stress in the wire when pipe is under pressure ? Take $E_s = 200 \times 10^9$ N/m², $\mu = 0.3$. 20

5. A cantilever of rectangular section 40 mm (width) × 60 mm (depth) is subjected to an inclined loan P at the free end. The inclination of the load is 25° to the vertical. If the length of the cantilever is 2 m and maximum stress due to bending in not to exceed 200 MN/m², determine the value of P. 20

SECTION – C

6. A thick spherical shell of 125 mm internal radius and 50 mm thick is subjected to an internal pressure of 5 MPa. Determine the variation of hoop and radial stresses in the shell. Also find the increases in internal and external radii. Take E = 200 GPa, 1/m = 0.30. 20