SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR

ROLL NO: | | | | | | | | | | | | | **Total number of pages:[2]**

B. Tech. - ME/ 4th Semester M/18

Strength of Materials-II

Subject Code: ME-202 (RP)

Paper ID: 2010batch

Time allowed: 3 Hrs **Max Marks: 60**

Important Instructions:

- **Section A is compulsory**
- **Attempt any four questions from section B**
- **Attempt any two questions from section C**
- **Assume any missing data**

PART A (2×10)

Q. 1. Answer in brief:

(a) What do you mean by Modulus of Resilience?

(b) List theories suitable to design ductile materials.

(c) What do you mean by spring? Give examples of Flat spiral spring?

(d) State Castigliano's theorem.

(e) What do you mean by Energy of Distortion?

(f) What do you understand by Hoop stress and Axial stress in thick cylinders?

(g) State the necessary condition for compounding of thick cylinders?

(h) What do you understand by shear center?

(i) What is the importance of Disk of uniform Strength?

(j) Why cross section of crane hook is generally trapezoidal?

PART B (5×4)

Q. 2. Derive the expression of strain energy in a simply supported beam of length 'L', carrying concentrated load 'W' at the center.

Q. 3. What is the necessity of theory of Failure? Discuss various theories of failure with the help of a comparative graphic representation.

Q. 4. A crane hook has trapezoidal cross section, 50mm wide at the inner side, 25mm wide at the outer side and 50 mm thick carries a load of 10kN whose line of action is 60mm away from the inside

edge of the section. The centre of curvature is 50*mm* from inside edge. Compute the stresses on the inner and outer fibers of the hook.

Q. 5. A wheel with thin rim of diameter 1000*mm* is made of a material with density 7100kg/m^3. What is the maximum speed at which it may rotate without the stress exceeding 205 *MPa*. Also estimate the increase of wheel diameter at this speed? Neglect effect of spokes. Take E= 200*GPa*.

Q. 6. Prove that the ratio of maximum and average value of the shear stress in a circular section is 1.33. Also draw the distribution of the shear stress in the beam.

PART C (10×2)

Q. 7. Derive Lame's equations for a thick cylinder of internal radius r_i and external radius r_o, subjected to internal pressure 'p_i' and external pressure 'p_o'.

Q. 8. A semi elliptic leaf spring with five leaves and of length 600 *mm* is to absorb 600 *Nm* of energy without exceeding bending stress of 800*MPa* and deflection of 50*mm*. Determine the width and thickness of leaves. Also calculate the length of each leaf. Take E = 200*GPa*.

Q. 9. A solid circular shaft is required to carry a torque of 40 *kNm* and a bending moment of 30 *kNm*. If yield stress in a simple tensile test on the material of the shaft was found to be 300 *MPa*, find the minimum required diameter of the shaft according to von-Mises Theory. Take a factor of safety = 3.

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