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May 2023

B.Tech. IV SEMESTER

ADVANCE STRENGTH OF MATERIALS (ME-212C)

Time: 3 Hours **Max. Marks:75**

Instructions:
1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. *Use any suitable data any if missing*

PART -A

Q1 (a) Differentiate the gradually applied load and suddenly applied load. (1.5)

(b) State the Castigliano's theorem for deflection of beam. (1.5)

(c) Differentiate between closed coil and opened coiled helical spring. (1.5)

(d) What do mean by spring rate? (1.5)

(e) Differentiate the thick and thin shells. (1.5)

(f) Why are thin cylinders wire wound? (1.5)

(g) What do you understand by a rotating disc of constant strength? (1.5)

(h) What do you mean by hoop stress? (1.5)

(i) What do you mean by curved beam? (1.5)

(j) What do you mean by strain invariant? (1.5)

PART -B

Q2 A steel rod of 30 mm in diameter and 2 m length has a pull of 50 kN suddenly applied to it. Make calculations for (a) maximum instantaneous stress induced and the instantaneous elongations and (b) the strain energy absorbed and the modulus of resilience. Take E= 2×10^5 N/mm^2 (15)

Q3 A leaf spring 1.2 m long has 8 plates 75 mm wide and 10 mm thick. When loaded, the maximum bending stress is limited to 160 N/mm^2. Determine the maximum load that can be applied to the spring. Take modulus of elasticity of spring material E= 2×10^5 N/mm^2. (15)

Q4 A thick cylindrical pipe of 240 mm outer diameter and 160 mm is required to withstand an internal fluid pressure of 15 MPa. Calculate the minimum external pressure that can be applied with the design requirement that stress in metal does not exceed 20MPa. (15)

Q5 A disc of uniform thickness with 40 mm diameter has a central hole of 10 cm diameter. The disc turns 6000 rev/min about its axis. Set up a relation for variation in circumferential stress and radial stress along the disc radius and compute the values of theses stresses at 15 cm radius. (15)
Also find out the maximum value of circumferential, radial and shear stresses in the disc?

For the disc material take $\rho = 7500\ kg/m^3$ and $\mu = 0.3$.

Q6 Determine the ratio of maximum and minimum values of the stresses for a curved bar of rectangular section in pure bending. Radius of curvature is 8 cm and depth of beam is 6 cm. locate the neutral axis. (15)

Q7 The displacement field on micro units for a body is given by (15)

$u = (x^2+y)i + (3+z)j + (x^2+2y)k$

determine the principal strain at (3,1, -2) and the direction of the minimum principal strain.

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