Code No: 134CD **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year II Semester Examinations, February -2024

STRENGTH OF MATERIALS – II

(Civil Engineering)

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

Note: i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	Write different types of springs.	[2]
b)	Define Torsion, Torsional Rigidity and Polar moment of inertia.	[3]
c)	Define slenderness ratio.	[2]
d)	Define the 'Beam' and the type of action and deformation it undergoes.	[3]
e)	What is Bending stress?	[2]
f)	What do you mean by the Middle third rule for rectangular sections?	[3]
g)	State the assumptions made in Lame's theory for the analysis of thick cylinders.	[2]
h)	Name the stresses set up in a thin cylinder subjected to internal fluid pressure.	[3]
i)	Sketch the Shear Flow for a symmetrical channel section.	[2]
j)	What is unsymmetrical bending?	[3]

PART – B

(50 Marks)

2.a) Explain the springs in series and parallel.

b) A leaf spring carries a central load of 2.5 kN. It is made of 10 steel plates of 5cm wide and 6 mm thick. If the bending stress is limited to 120 N/mm^2, find the length of the spring and deflection at the center of the spring. Take E = 200 GPa. [5+5]

OR

3. Prove that the maximum shear stress induced in the wire of a close-coiled helical spring is given by,

$$\tau = \frac{16.W.R}{\pi.d^3}$$

Where, τ = Maximum shear stress induced in the wire, w = Axial load on spring, R = Mean radius of spring coil, and d = diameter of spring wire. [10]

4.a) Determine the section of a cast iron hollow cylindrical column 3m long with both ends fixed, if it carries an axial load of 800kN. The ratio of internal to external diameter of the column is 5/8. Use Rankine's formula by taking Rankine's constant as 1/1600 and working crushing strength of material as 550N/mm^2.

b) Write short notes on Secant formula. [7+3]

OR

5. Derive an expression for the Euler's crippling load for a long column with Both ends are fixed. [10]

6.a) State the conditions of stability for dams.

b) Prove that an eccentric load causes a direct stress as well as bending stress. [4+6]

OR

7. Determine: (a) location of the neutral axis, (b) maximum and minimum stresses, and (c) ratio of maximum and minimum stress, when a curved beam of rectangular cross-section of width 10mm and depth 20mm is subjected to pure bending of moment +50 NM. The beam is curved in a plane parallel to depth. The mean radius of curvature is 25 mm. Also, plot the variation of stresses across the section. [10]

8.a) Determine the maximum hoop stress across the section of a pipe of external diameter 600mm and internal diameter 440 mm, when the pipe is subjected to an internal fluid pressure 20 N/mm^2.

b) A thin cylinder of internal diameter 1.25 m contains a fluid at an internal pressure of 2 N/mm^2. Determine the maximum thickness of the cylinder if: (i) the longitudinal stress is not to exceed 30 N/mm^2, (ii) the circumferential stress is not to exceed 45 N/mm^2. [5+5]

OR

9.a) Derive an expression for the radial pressure and hoop stress for a thick spherical shell.

b) A spherical vessel 1.5 m diameter is subjected to an internal pressure of 2 N/mm^2. Find the thickness of the plate required if maximum stress is not to exceed 150 N/mm^2 and joint efficiency is 75%. [3+7]

10.a) Analyze the shear center of a symmetrical channel section of 400mm(flange) × 200mm(web) outside and 5mm thick.

b) Explain the concept of shear center with suitable example. [5+5]

OR

11. A beam of rectangular section 80mm wide and 120mm deep is subjected to a bending moment of 12kN.m The trace of the plane of loading is inclined at 450 to the y-y axis of the section. Locate the neutral axis of the section and calculate the maximum bending stress induced is the section. [10]

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