

II B. Tech II Semester Supplementary Examinations, April - 2021

STRENGTH OF MATERIALS-II

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. Answer **ALL** the question in **Part-A**
 3. Answer any **FOUR** Questions from **Part-B**

PART -A

1. a) Show that in a strained material subjected to two-dimensional stress, the sum of the normal components of stresses on any two mutually perpendicular planes is constant.
- b) Explain the terms torsional rigidity and polar modulus.
- c) What are the Types of columns?
- d) A 10 m high masonry chimney of external diameter 2 m and internal diameter 1.5 m is subjected to wind pressure of 1000 N/m^2 . Determine the stresses at the base if weight of masonry is 20 kN/m^3 .
- e) State and explain Principle axis.
- f) When is method of section mostly used in determining forces?

PART-B

2. A steel shaft is subjected to an end thrust producing a stress of 90 MPa and the minimum shearing stress on the surface arising from torsion is 60 MPa. The yield point of the material in simple tension was found to be 300 MPa. Calculate the factor of safety of the shaft according to the following theories:
 - (i) Maximum shear stress theory;
 - (ii) Maximum distortion energy theory.
3. When a circular shaft is subjected to torsion, show that the shear stress varies linearly from the axis to the surface?
4. a) A steel column of hollow circular section, 65 mm external diameter and 50 mm internal diameter is 2.50 m long and is hinged at its ends. The line of action of the load is parallel to the axis but is eccentric. Find the maximum eccentricity for a crippling load equal to 75% of the Eulerian axial load. Take yield stress of steel equal to 310 N/mm^2 , and $E = 2.06 \times 10^5 \text{ N/mm}^2$.
- b) A 1.5 metre Long column has a circular cross-section of 50 mm diameter. One end of the column is fixed in direction and position and the other end is free. Taking a factor of safety of 3, calculate the safe load using Rankine's formula :Take $f_c = 560 \text{ N/mm}^2$ and $\alpha = \frac{1}{1600}$ for pinned ends.

5. a) A 20 meter high masonry chimney is 2 metres square at the base and tapers to 1 metre square at the top. The tapered central flue is circular in cross-section and 1 metre diameter at the base.
- b) A masonry dam 8 metres high, 1.5 metres wide at the top and 5 metres wide at the base retains water to a depth of 7.5 metres, the water face of the dam being vertical. Find the maximum and minimum stress intensities at the base. The weight of water is 9810 N/cum. While the weight of masonry is 22000 N/cum.
6. Derive the equation of moment of inertia of the rectangular section about its centroidal axis from the first principles.
7. Describe the methods employed for finding the forces in a frame with an example.