R16

Code No: 134CD

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, April - 2018
STRENGTH OF MATERIALS – II
(Common to CE, CEE)

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

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A
(25 Marks)

1.a) Define torsional rigidity of a shaft. [2]
b) What are the assumptions in torsion theory? [3]
c) Write the limitations of Euler's theory. [2]
d) What is the effective length of a column having (i) both end fixed (ii) both ends hinged? [3]
e) State the condition for no tension in the section? [2]
f) State the assumptions made in Lame's theory. [3]
g) What is the nature of circumferential, longitudinal stresses in a thin cylinder? [2]
h) A boiler shell 200 cm diameter and 1.5 cm thickness is subjected to an internal fluid pressure of 1.5 MPa. What is the hoop stress induced in the vessel? [3]
i) State the reasons for unsymmetrical bending. [2]
j) Write the shear centre equation for channel section. [3]

PART-B
(50 Marks)

2.a) Derive the expression for strain energy stored in a shaft subjected to torsion.
b) A hollow shaft with external and internal diameters of 120 mm and 80 mm respectively is to be replaced by a solid shaft of the same weight. Find the torque transmitted by the shafts if the permissible shear stress is 100 MPa. If the solid shaft is replaced by a hollow shaft of 160 mm external diameter, what is the torque transmitted for the same weight of the shafts. [5+5]

OR

3.a) A railway wagon weighing 40 k N and moving with a speed of 8 km/h is supported by a buffer of 4 springs whose maximum allowable compression is 150 mm. Find out the number of turns in each spring,if the diameter of the spring wire is 14 mm and the diameter of coil is 80 mm. Assume C= 84 GN/m^2 .
b) Derive the expression for angle of twist of helical springs subjected to axial torque. [5+5]

4.a) State Euler's assumptions in column theory.
b) Derive the expression for Euler's crippling load for column with both ends hinged. [5+5]

OR

5.a) A hollow cylindrical cast iron column is 4 m long and fixed at the ends. Design the column to carry an axial load of 250 kN. Use Rankine's formula and adopt a factor of safety of 5. The internal diameter may be taken as 0.8 times the external diameter. Take fc = 550 N/mm^2 and Rankine's constant is 1/1600.

b) Derive the expression for maximum deflection for a pin jointed strut with axial compressive load along with central concentrated load. [5+5]

6. A tapering chimney of hollow circular section is 30 m high. Its external diameter at the base is 2.4 m and at the top is 1.6 m. It is subjected to the wind pressure of 2.2 k N/m^2 of the projected area. If the weight of the chimney is 4000 k N and the internal diameter at the base is 0.8 m, determine the maximum and minimum stress intensities at the base. [10]

OR

7.a) Derive the expression to determine the stress in a circular ring acted upon by a tensile load.

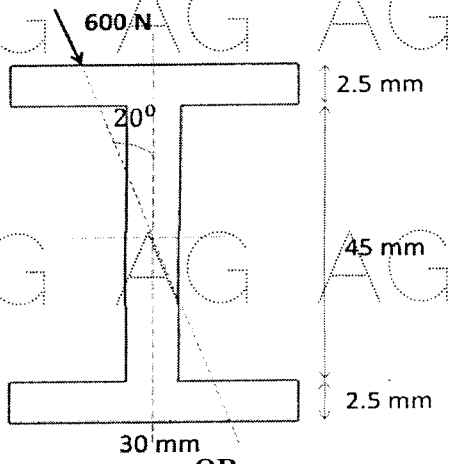
b) A curved bar of 30 mm square section has a mean radius of curvature of 45 mm. Assuming the bar initially to be unstressed, find the stresses at the inner and outer faces when a bending moment of 300 N m is applied to the bar tending to straighten it. [5+5]

8. A non- ferrous metal tube having a bore of 32mm and a wall thickness of 1.6 mm has plugged ends. The effective length of the tube between the plugs is 500 mm and the internal fluid pressure of 2 N/mm^2 is applied .An axial pull of 2000N is also applied externally to the plugs. Determine when the forces are acting (a) the change in the internal diameter of the tube (b) change in the length. E= 104500 N/mm^2 and poisson's ratio =0.35. [5+5]

OR

9. A Cylindrical vessel is 2 m diameter and 5 m long is closed at ends by rigid plates. It is subjected to an internal pressure of 4 N/m^2. If the maximum principal stress is not to exceed 210 N/mm^2, find the thickness of the shell. Assume E=2 $\times 10^5$ N/mm^2 and poisson's ratio 0.3. Find the changes in diameter, length and volume of the shell. [10]

10. A Cantilever of I-section, 2.4 m long is subjected to a load of 600 N at the free end as shown in Figure. Determine the resulting bending stress at corners A and B, on the fixed section of the cantilever. [10]



OR

11. Find the principal moment of inertia of angle section 60 mm × 40 mm × 6 mm. [10]

---ooOoo---