RegulationR18 *Subject Code:* **2P4AB**

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech IV Semester Regular Examinations, November 2020

Strength of Materials-II

(Civil Engineering)

Maximum Marks: 70 **Date:05.11.2020** Duration: 2hours

Part-A

All the following questions carry equal marks **(10x1M = 10 Marks)**

1. Write the assumptions made by theory of Pure torsion. [1M]
2. Determine the power (kW) transmitted by a shaft rotating at 150 rpm and subjectedto a twisting moment of 30 kNm. [1M]
3. What are the assumptions made in the derivation of Euler's formula? [1M]
4. What are the modes of failure of short and long columns? [1M]
5. What is a beam-column member? [1M]
6. Obtain the core of a circular section of diameter 'D'. [1M]
7. Define shear center of a section. [1M]
8. What are the conditions responsible for unsymmetrical bending? [1M]
9. Distinguish between thin and thick cylinders. [1M]
10. Defined unsymmetrical bending. [1M]

Part-B

Answer any FIVE questions. **(12M X 5 = 60Marks)**

11. A steel solid circular shaft is required to resist bending moment of 75 kNm in addition to twisting moment of 25 kNm. Design the shaft according to (a) maximum shear stress theory and (b) maximum strain energy theory. Adopt Poisson's ratio = 0.3 and the yield stress of the shaft material is 260 N/mm^2. [6M] [6M]

12. Design a close coiled helical spring with mean radius equal to10 times the diameter of the wire. The spring is to absorb 1.2 kNm energy with an extension of 125 mm and the maximum shear stress in the spring is not to exceed 80 N/mm^2. The modulus of rigidity is 0.85×10^5 N/mm^2. [12M]

13. Design a hollow circular section mild steel column, 6.0 m long with both ends hinged, to carry an axial load of 450 kN with a factor of safety of 3. Adopt the internal diameter is 0.75 times the external diameter. Adopt the Rankine's constants are fc =325 MPa and α = 1/7500. [12M]

14. A circular beam of radius 4 m has uniform cross-section is supported on six symmetrically placed columns. The beam is subjected to a uniformly distributed load of intensity 25 kN/m. Draw the shear force and bending moment diagrams. [12M]

15. A 3 m long tubular steel hinged strut with external and internal diameters of 150 mm and 125 mm, respectively, is subjected to an axial load of 90 kN and a transverse load 25 kN at its mid-span. Analyse the member and also determine the maximum bending moment. [12M]

16. A masonry dam 9 m high, 1.5 m wide at the top and 4 m wide at the base has its water face vertical and retains water to a depth of 8.5 m. Find the maximum and minimum stress intensities at the base. Assume the unit weight of masonry is $20kN/m^3$ [12M]

17. A cantilever beam of span 1.5 m has an unequal angle section 90 mm × 60 mm × 10 mm and is placed with the longer leg vertically downward. The beam cross-section is subjected to a bending moment of 20 kNm acting in the vertical plane passing through the centroid of the section. Determine the maximum bending stress induced in the section. [12M]

18. A simply supported steel beam of span 3.6 m has symmetrical I-section 100 mm × 200 mm × 10 mm. The beam is subjected to a concentrate load of 60 kN at the mid-span in a plane making an angle 300 with respect to vertical and passing through the centroid of the section. Determine the maximum deflection. [12M]

19. A steel cylindrical shell of 12 mm thickness, 1.5 m diameter and 3 m long is carrying a fluid at a pressure of 3 N/mm^2. Find the change in diameter, change in length and change in volume of the cylinder. [12M]

20. The external and internal diameters of a steel cylinder are 900 mm and 600 mm, respectively. The cylinder is subjected to an external and internal fluid pressures of 120 GPa and 12 GPa, respectively. Draw the radial and hoop stress distribution across the thickness of the shell. [12M]