REGISTRATION NUMBER | | | | | | | | | | |

SRINIX COLLEGE OF ENGINEERING

3rd INTERNAL EXAMINATION-2022

Subject-**MECHANICS OF SOLID** Semester-**3rd** Branch-**CIVIL/ MECH**

Full Mark-**100** Time-2 Hrs

TYPE A - SHORT QUESTION **[2×10]**

1. Define the following terms: (i) Modulus of Rigidity (ii) Factor of safety.
2. State principle of superposition.
3. Define the terms i) Resilience ii) Proof resilience iii) Modulus of resilience
4. What is meant by kern of a section? Sketch the kern of i) circular and ii) square sections.
5. Define a)point of contra flexure b)Moment of resistance
6. What do you mean by principal planes and principal stresses.
7. Differentiate between closed coiled and open coiled helical springs.
8. What are the fundamental types of stresses? Give one example for each type.
9. State and briefly explain Saint Venant's principle.
10. What do you mean by composite beams? What is its utility?
11. How flexural strength is related to strength of any beam? Give the order of strength of different cross-sections?
12. What is Mohr's stress circle ? How is it useful in the solution of stress analysis problems?

TYPE B **[6×8]**

1. The stresses at a point in a strained material are 50 MPa tensile and 20 MPa tensile, on two mutually perpendicular planes along with shear stress of 15 MPa. Find the principal stresses and planes on which they act. Also find the maximum shear stress and its plane.
2. A thick spherical shell of inside diameter 180 mm is subjected to an internal fluid pressure of 50 MPa. Find the thickness of the shell, if the maximum permissible tensile stress in the shell is 190 MPa.
3. Define effective length of a column. Give the effective lengths for various end conditions.
4. Calculate the safe compressive load on a hollow cast iron column with one end rigidly fixed and other hinged, of 15 cm external diameter, 10 cm internal diameter and 10 m in length. Use Euler's formula with a factor of safety 5 and E = 95 kN/mm2

5. Write down the expression for elongation of tapering bars of (i) circular cross section (ii) rectangular cross section Distinguish between torsional rigidity andflexural rigidity.
6. A cantilever beam of span L, fixed at the left end, carries a clockwise moment M at its centre and a point load at the free end. Draw the SFD and BMD
7. Define point of contra flexure and section modulus.
8. What are beams of uniform strength?

TYPE C <u>LONG QUESTIONS</u> **[16×2]**

1. A)Define strain energy and complimentary strain energy. Derive an expression for strain energy in a body subjected to axial stress.

   B) A steel bar is placed between two copper bars each having the same area and length as the steel bar at 15°C. At this stage they are rigidly connected together at both the ends. When the temperature is raised to 315°C, the length of the bars increases by 1.50 mm. Determine the original length and the final stresses in the bars. Take Es= 2.1 x 105 N/mm2 ,Ec = 1 x 105 N/mm2 , αs = 0.000012 per °C, αc = 0.0000175 per °C.

2. A) Derive the expression for elongation of a bar due to its own weight.

   B) A bar of 20 mm diameter is subjected to a pull of 50 kN. The measured extension on gauge length of 250 mm is 0.12 mm and change in diameter is 0.00375 mm.Calculate:
   i) Young's modulus ii) Poisson's ratio iii) Bulk modulus

   C) A steel rod tapers uniformly from 20 cm diameter at one end to 5 cm diameter at the other in a length of 75 cm. How much will it stretch under an axial pull of 5 kN. Given E = 2 x 105 kN/cm2 .

3. Establish relation between load, shear force and bending moment. Construct shear force diagram and bending moment diagrams for a beam ABE, 3L/2 m long, which is supported at A and B, 'L' m long. The beam carries a concentrated load of 2W at L/4 distance from left support A, and point load W/2 at E. It also carries an upward point load of W at a distance of L/4 from support B.