

Roll No. 

Total No. of Pages : 02

Total No. of Questions : 09

**B.Tech. (AE) (Sem.-3rd)**  
**MECHANICS OF MATERIALS**  
**Subject Code : AE-201**  
**Paper ID : [A0701]**

Time : 3 Hrs.

Max. Marks : 60

**INSTRUCTION TO CANDIDATES :**

1. **SECTION-A** is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **FIVE** questions carrying **FIVE** marks each and students has to attempt any **FOUR** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students has to attempt any **TWO** questions.

**SECTION-A**

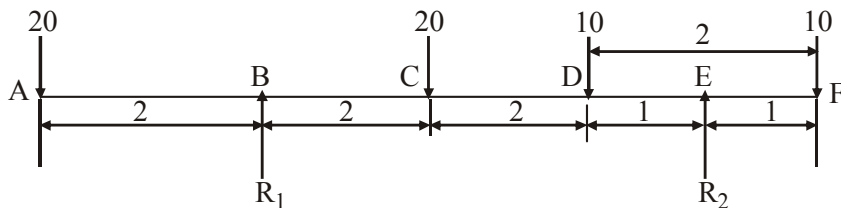
1. Write briefly :
  - a. What are different types of strains?
  - b. What is the main difference between the stress-strain diagrams for ductile and brittle materials?
  - c. What is the application of Mohr's circle?
  - d. What is meant by Point of Contraflexure?
  - e. Four springs are in series. How will you find out the equivalent stiffness of this system?
  - f. What is the main difference between closed coil and opened coil helical spring?
  - g. Give real life examples of a cantilever beam.
  - h. What is double integration method?
  - i. Write about possible applications of Rankine's formula.
  - j. What is meant by crippling load?

### SECTION-B

- A bar of varying cross-section has a uniform taper. Derive the formula for strain and deflection in the bar.
- Show the application of Mohr's circle to a compound stress condition.
- Sketch the bending moment and shear force diagrams for following cases:
  - Simply supported beam with a concentrated load at the mid span.
  - Simply supported beam with uniformly distributed load over whole of its span.
- Derive torsional formula and show its application to a hollow shaft.
- Derive Euler's formula for a column.

### SECTION-C

- Draw the shear force and bending moment diagrams for a beam shown below. All loads are in kN and all distances are in m.



- A beam of 3 m length is simply supported at ends. It carries uniformly distributed load of 4 kN/m over whole of its length in addition to negative bending couples of 2kNm at each end. Taking  $EI = 6 \times 10^6 \text{ Nm}^2$ , find the mid span deflection,
- For a line shaft running at 200 rpm and of 5 cm diameter throughout its length, a torque of 200 Nm is applied at B. Torques taken off from the shaft to various machines from sections A, C and D are 100 Nm, 20 Nm and 80 Nm respectively. Show variation of torque, surface shear stress and relative angle of twist along the length of the shaft. What is the maximum shear stress and the angle of twist between the ends of the shaft ? Take  $G = 80 \text{ GPa}$ . Neglect bending of shaft.

