



## End Term (Odd) Semester Examination November 2025

Roll no.....

Name of the Course and semester: B Tech. V<sup>th</sup> Semester (M.E.)

Name of the Paper: Design of Machine Elements- I

Paper Code: TME-502

Time: 3 hour

Maximum Marks: 100

**Note:**

- (i) All the questions are compulsory.
- (ii) Answer any two sub questions from a, b and c in each main question.
- (iii) Total marks for each question is 20 (twenty).
- (iv) Each sub-question carries 10 marks.

- Q1. (2X10=20 Marks) *Co 1*
- a. Explain the various phases of mechanical design and their importance in product development. (CO1)
  - b. Discuss the different factors influencing the design of machine elements with suitable examples. (CO1)
  - c. Explain the procedure for selecting engineering materials for a machine component. What are the key considerations? (CO1)
- Q2. (2X10=20 Marks) *Co 2*
- a. Derive the relationship between axial stress, bending stress, and torsional stress for a machine component. (CO2)
  - b. Explain the concept of Principal Stresses and determine them for a two-dimensional stress system. (CO2)
  - c. What is a Factor of Safety? Discuss how it is chosen for different materials and loading conditions. (CO2)
- Q3. (2X10=20 Marks) *Co 3*
- a. Explain the difference between Low Cycle and High Cycle Fatigue with suitable examples. (CO3)
  - b. Draw and explain the S-N Curve and its significance in fatigue design. (CO3)
  - c. Define Endurance Limit and explain how it is affected by size, surface finish, and stress concentration. (CO3)
- Q4. (2X10=20 Marks) *Co 4*
- a. Derive the equation for the torsional strength of a solid circular shaft. (CO4)
  - b. Design a transmission shaft to transmit a given power at a specific speed using ASME/BIS code recommendations. (CO4)
  - c. Explain the design procedure for a shaft subjected to fluctuating bending and torsional loads. (CO4)
- Q5. (2X10=20 Marks) *Co 5*
- a. Design a riveted joint for a boiler shell with given internal pressure and dimensions. (CO5)
  - b. Explain the design procedure for an eccentrically loaded welded joint subjected to bending and torsion. (CO5)
  - c. Compare the strength of Butt, Fillet, and Parallel welded joints. (CO5)