

B.Tech**(SEM I) THEORY EXAMINATION 2022-2023****Fundamental of Mechanical Engineering and Mechatronics****Time: 3 Hours****Total Marks: 100****Note:**

1. Attempt all Sections. If require any missing data; then choose suitably.
2. The question paper may be answered in Hindi Language, English Language or in the mixed language of Hindi and English, as per convenience.

SECTION A

1. **Attempt all questions in brief.** **2 x 10 = 20**
- a. State Hooke's law.
 - b. Discuss working stress and factor of safety.
 - c. Discuss the terms used in IC engine - TDC, BDC, Stroke and Bore.
 - d. Explain tonnage of refrigeration.
 - e. Explain Newton's law of viscosity.
 - f. Write the continuity equations for compressible and non-compressible fluids.
 - g. Discuss various errors in measurement.
 - h. Differentiate between precision and accuracy.
 - i. Define the terms avionics, bionics and autotronics.
 - j. Define gear and list its types.

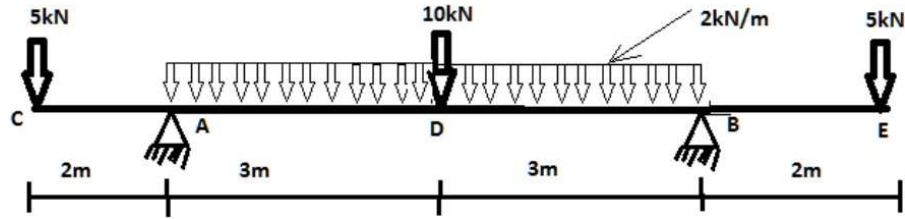
SECTION B

2. **Attempt any three of the following:** **10x3=30**
- a. Explain with neat sketch the stress & strain diagram for a ductile and brittle material.
 - b. Explain the working of four stroke petrol engine with neat diagram.
 - c. State Pascal's Law and give examples where it is applied.
Determine the density, specific weight, and weight of one liter of fluid having specific gravity 0.65.
 - d. What are control systems? Enumerate the elements of control system.
 - e. What do you understand by Transducer? Describe its type and characteristics.

SECTION C

3. **Attempt any one part of the following:** **10x1=10**
- a. A specimen of steel 20mm diameter with a gauge length of 200mm was tested to failure. It undergoes an extension of 0.20mm under a load of 60kN. Load at elastic limit is 120kN. The maximum load is 180kN. The breaking load is 160kN. Total extension is 50mm and the diameter at fracture is 16mm.
Find:
 - (i) Stress at elastic limit
 - (ii) Young's modulus
 - (iii) % elongation
 - (iv) % reduction in area
 - (v) Ultimate strength
 - (vi) Nominal breaking stress

- b. Draw Shear Force diagram and Bending Moment diagram for the following beam.



4. Attempt any *one* part of the following: **10x1=10**
- Explain all the thermodynamic processes of vapour compression refrigeration system with a suitable diagram.
 - What is hybrid vehicle? Give the classification of hybrid vehicles. Compare the relative advantages and disadvantages among IC engine, Electric and Hybrid vehicles.
5. Attempt any *one* part of the following: **10x1=10**
- With a neat sketch illustrate the construction and working of Pelton Wheel Turbine.
 - With a neat sketch illustrate the construction and working of Reciprocating Pump.
6. Attempt any *one* part of the following: **10x1=10**
- List various temperature measuring devices. Explain temperature measuring device based on the principle of radiation with neat sketch.
 - Define pressure. List various pressure measuring devices. Explain the working of bourdon tube pressure gauge with neat sketch.
7. Attempt any *one* part of the following: **10x1=10**
- Discuss the evolution, scope, applications, advantages and disadvantages of Mechatronics.
 - Explain the following Mechanical Actuation Systems:
Kinematic Chains, Cam, Train Ratchet Mechanism, Belt and Bearing.