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CBCS SCHEME

USN | | | | | | | | | | BEMEM103/203

# First/Second Semester B.E./B.Tech. Degree Examination, June/July 2026
## Elements of Mechanical Engineering

Time: 3 hrs. Max. Marks: 100

***Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.***
***2. M : Marks , L: Bloom's level , C: Course outcomes.***

| | | Module – 1 | M | L | C |
|---|---|---|---|---|---|
| Q.1 | a. | Enumerate on the role of mechanical engineering in Automotive and Marine sectors covering manufacturing and quality aspects. | 10 | L2 | CO1 |
| | b. | Briefly explain the following terms with reference to steam formation.<br>(i) Specific heat<br>(ii) Specific volume<br>(iii) Internal energy<br>(iv) Enthalpy<br>(v) Degree of superheat | 10 | L2 | CO1 |
| | | **OR** | | | |
| Q.2 | a. | Sketch and explain the wind power plant. | 6 | L2<br>L3 | CO1 |
| | b. | Mention wind power plant's advantages, disadvantages and its applications. | 4 | L1 | CO1 |
| | c. | With the help of a neat sketch, explain the basic working principles of Fossil fuelled "THERMAL POWER PLANT". | 10 | L2 | CO1 |
| | | **Module – 2** | | | |
| Q.3 | a. | Explain the working principle of "CENTRE LATHE" with neat sketch. | 8 | L2 | CO1 |
| | b. | Enlist the operations that can be performed on Lathe. | 2 | L1 | CO2 |
| | c. | With neat sketches, explain the milling operations : (i) Plane milling (ii) End milling. | 10 | L2 | CO2 |
| | | **OR** | | | |
| Q.4 | a. | Explain the working of a "CNC Machine" with the help of block diagram. | 10 | L2 | CO2 |
| | b. | What do you understand by "3D printing"? | 4 | L1 | CO2 |
| | c. | Enumerate the merits and limitations of 3-D printing technology. | 6 | L3 | CO2 |

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| | | **Module – 3** | | | |
| **Q.5** | **a.** | With necessary sketches and P-V diagram, briefly explain the working of Four-Stroke-Petrol Engine. | **10** | **L2** | **CO3** |
| | **b.** | Following data are collected from a 4-stroke single cylinder engine at full load :<br>(i) Bore = 200 mm<br>(ii) Stroke = 280 mm<br>(iii) Speed = 300 rpm<br>(iv) Indicated mean effective pressure = 5.6 bars<br>(v) Torque on the brake drum = 250 N-m<br>(vi) Fuel consumed = 4.2 kg/hr<br>(vii) Calorific value = 41000 kJ/kg<br>Determine : (i) Mechanical efficiency<br>(ii) Indicated thermal efficiency<br>(iii) Brake thermal efficiency | **10** | **L3** | **CO4** |
| | | **OR** | | | |
| **Q.6** | **a.** | Enlist and enumerate the desirable properties of a good refrigerant. | **6** | **L2** | **CO3** |
| | **b.** | Describe the following terms with respect to refrigeration :<br>(i) COP (Co-efficient of Performance)<br>(ii) Ton of Refrigeration | **4** | **L2** | **CO3** |
| | **c.** | Explain the principle and operation of Vapour Compression Refrigeration (VCR) system with a suitable diagram. | **10** | **L2** | **CO3** |
| | | **Module – 4** | | | |
| **Q.7** | **a.** | Briefly explain "Flat Belt Drive" and "V-Belt Drive". | **6** | **L2** | **CO3** |
| | **b.** | Discuss the types of Gear Drives and also mention their application. | **6** | **L2** | **CO3** |

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| | c. | A pinion with 120 mm pitch circle diameter meshes with a gear of 400 mm pitch circle diameter. The number of teeth on pinion is 18 and it rotates at 1440 rpm.<br>Determine : (i) Gear ratio (ii) Number of teeth on gear<br>(iii) Speed of the gear | 8 | L3 | CO4 |
| | | **OR** | | | |
| Q.8 | a. | Explain the principle of Arc welding process with neat sketch and also mention its Industrial applications. | 8 | L2 | CO3 |
| | b. | Describe the type of flames that can be obtained in Gas Welding process, with an application of each. | 8 | L2 | CO3 |
| | c. | Differentiate between Brazing and Soldering process. | 4 | L2 | CO3 |
| | | **Module – 5** | | | |
| Q.9 | a. | Discuss on Global trend of the use of "E-vehicles" highlighting their impact on economy. | 10 | L2 | CO3 |
| | b. | With necessary sketches, explain the different "Robotic" configurations and their Industrial applications. | 10 | L2 | CO3 |
| | | **OR** | | | |
| Q.10 | a. | Describe the working of "Hybrid-Vehicles". | 6 | L2 | CO3 |
| | b. | Discuss the Merits and limitations of Electric-hybrid vehicles. | 4 | L2 | CO3 |
| | c. | Differentiate between "Open-loop" and "Close-loop" mechatronic systems. Cite the at least two examples for each. | 10 | L2 | CO3 |

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