

Reg No : ..... Name : .....

**MAR ATHANASIOUS COLLEGE OF ENGINEERING, KOTHAMANGALAM**

(Govt. Aided Autonomous Institution)

First Semester B.Tech. Degree (SAY) Examination, February, 2026

Course Code: B24ES1T05B

Course Name: Basic Civil and Mechanical Engineering (B)

Max. Marks: 100

Duration:3 Hours

**Instruction:** Answer PART- I & PART- II in separate answer books

**PART - I Basic Civil Engineering (50 Marks)**

**PART - A: 20 Marks (5 Qns x 4 Marks)**

**Answer all questions**

1. How green infrastructure systems helps to mitigate urban air pollution?
2. List the different types of bonds used in brick masonry with sketch
3. Differentiate between carpet area and built-up area in terms of measurement and usage.
4. Building materials like stone, building blocks etc needs to be thoroughly wetted before using in masonry works. Why?
5. Identify and briefly describe the occupancy category under which hospitals fall according to the NBC of India.

**PART - B: 30 Marks (3 Qns x 10 Marks)**

**Answer any one full question from each module**

**Module 1**

6. List and explain different types of sand used in construction, detailing their characteristics to use it in quality works.

OR

7. In the current scenario of increasing levels of pollution, how does environmental engineering contribute in protecting and improving our natural environment?

**Module 2**

8. Discuss the importance of soil characteristics in the selection of shallow and deep foundations.

OR

9. Sketch shell roofing system and folded plates for a large industrial building and explain its benefits.

**Module 3**

10. Discuss the classification of buildings based on occupancy as per NBC guidelines.

OR

11. Discuss the challenges and strategies for implementing water management systems in green buildings in a tropical climate like Kerala.

**PART - II Basic Mechanical Engineering (50 Marks)**

**PART - A: 20 Marks (5 Qns x 4 Marks)**

**Answer all questions**

1. Explain the fundamental differences between series and parallel hybrid engines.
2. State the various application of gear drives.
3. How do you perform a taper turning operation on a lathe?
4. Evaluate the advantages of using a CRDI system in modern diesel engines.
5. How does the process of arc welding generate the heat required for joining metals?

**PART - B: 30 Marks (3 Qns x 10 Marks)**

**Answer any one full question from each module**

**Module 4**

6. Describe the working principle of a two-stroke petrol engine with neat sketches. How do they differ from a four-stroke petrol engine's cycle?

OR

7. In an air-standard Otto cycle, the pressure and temperature at the start of the compression stroke are 0.1 MPa and 300 K, respectively. The temperature at the end of the compression and at the end of the heat addition processes are 600K and 1,600 K, respectively. Calculate: (i) thermal efficiency, (ii) heat added, (iii) net work per kg of air, and (iv) mean effective pressure. For air,  $R = 0.287 \text{ kJ/(kg K)}$ ;  $c_p = 1.005 \text{ kJ/(kg K)}$ ;  $c_v = 0.718 \text{ kJ/(kg K)}$ ;  $\gamma = 1.4$ .

### **Module 5**

8. Derive the relation for ratio of belt tensions in a flat belt drive. A belt drive transmits 8kW of power from a shaft rotating at 240 rpm to another shaft rotating at 160 rpm. The belt is 8mm thick. The diameter of the smaller pulley is 600 mm and the two shafts are 5 m apart. The coefficient of friction is 0.25. If the maximum stress in the belt is limited to  $3\text{N/mm}^2$ , find the width of the belt for an open belt drive.

OR

9. Explain the various part of an automatic transmission system with the help of a neat sketch.

### **Module 6**

10. Describe the rolling process and its applications in the metalworking industry.

OR

11. Explain the primary components of a summer air conditioning system, and how do they function?

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