

**R.N.G.PATEL INSTITUTE OF TECHNOLOGY-RNGPIT**  
(An Autonomous Institute U/s UGC Act 1956)

**B.Tech. SEMESTER-I, SEMESTER END EXAMINATION – WINTER 2025**

**SUBJECT CODE: 2ME105**

**DATE: 24-12-2025**

**SUBJECT NAME: FUNDAMENTALS OF MECHANICAL AND  
ELECTRICAL ENGINEERING**

**TIME: 11:00 AM to 01:30 PM**

**TOTAL MARKS: 70**

**Instructions**

1. It is **compulsory** for students to write **Enrolment No. /Seat No.** on the question paper.
2. Write answers of **Section A** and **Section B** in **separate answer books**.
3. Attempt all questions from both **Section A** and **Section B**.
4. Each section carries **35 marks**, with a total of **70 marks** for the examination.
5. The figures to the right of each question indicate full marks, make suitable assumptions with justification.
6. BL - Cognitive Level (As per Revised Bloom's Taxonomy) (R-Remember, U-Understanding, A –Application, N –Analyze, E – Evaluate, C -Create), CO - Course Outcomes.

**SECTION A**

	<b>Marks</b>	<b>BL</b>	<b>CO</b>
<b>Q.1 (a)</b> Explain specific heat capacity and explain its significance.	<b>03</b>	<b>U</b>	<b>1</b>
<b>(b)</b> Define Following Terms: (1) Force      (2) Pressure      (3) Work      (4) Power	<b>04</b>	<b>R</b>	<b>1</b>
<b>Q.2 (a)</b> Explain Charles's law and list out its application.	<b>03</b>	<b>U</b>	<b>2</b>
<b>(b)</b> State Boyle's law and derive the relation between pressure and volume of a gas at constant temperature.	<b>04</b>	<b>R</b>	<b>2</b>
<b>(c)</b> Explain adiabatic process with P-V Diagram and prove $PV^\gamma = \text{Constant}$ for adiabatic process. Also derive work done, heat transfer and P, V, T relation for it.	<b>07</b>	<b>U</b>	<b>2</b>
<b>OR</b>			
<b>Q.2 (a)</b> Explain the physical significance of Cp and Cv.	<b>03</b>	<b>U</b>	<b>2</b>
<b>(b)</b> Describe the process of steam formation.	<b>04</b>	<b>R</b>	<b>2</b>
<b>(c)</b> Explain construction and working of Barrel calorimeter.	<b>07</b>	<b>U</b>	<b>2</b>
<b>Q.3 (a)</b> What is a steam boiler? Explain its basic working principle.	<b>03</b>	<b>R</b>	<b>3</b>
<b>(b)</b> Explain working of a Cochran boiler and list out its advantages.	<b>04</b>	<b>U</b>	<b>3</b>
<b>(c)</b> Explain the Lancashire boiler with a neat diagram.	<b>07</b>	<b>U</b>	<b>3</b>

**OR**

<b>Q.3</b>	<b>(a)</b> What are boiler mountings? Explain their functions briefly.	<b>03</b>	<b>R</b>	<b>3</b>
	<b>(b)</b> Give detail classification of steam boilers.	<b>04</b>	<b>U</b>	<b>3</b>
	<b>(c)</b> Explain the working of a Babcock and Wilcox boiler with a neat diagram.	<b>07</b>	<b>U</b>	<b>3</b>

**SECTION B**

		<b>Marks</b>	<b>BL</b>	<b>CO</b>
<b>Q.4</b>	<b>(a)</b> What is priming? Why is it necessary	<b>03</b>	<b>R</b>	<b>4</b>
	<b>(b)</b> Differentiate between vapor compression and vapor absorption refrigeration systems.	<b>04</b>	<b>U</b>	<b>4</b>
<b>Q.5</b>	<b>(a)</b> Give the comparison of fuse and MCB.	<b>03</b>	<b>R</b>	<b>5</b>
	<b>(b)</b> Derive the Average value of sinusoidal current wave form.	<b>04</b>	<b>U</b>	<b>5</b>
	<b>(c)</b> Explain Safety precautions for electrical appliances.	<b>07</b>	<b>U</b>	<b>5</b>

**OR**

<b>Q.5</b>	<b>(a)</b> Compare the resistive series and parallel circuit.	<b>03</b>	<b>R</b>	<b>5</b>
	<b>(b)</b> Define following terms (1) Frequency (2) Time Period (3) Maximum value (4) Form Factor	<b>04</b>	<b>R</b>	<b>5</b>
	<b>(c)</b> Explain with neat sketch general construction of cable.	<b>07</b>	<b>U</b>	<b>5</b>
<b>Q.6</b>	<b>(a)</b> Explain key structural components of a PV module.	<b>03</b>	<b>R</b>	<b>6</b>
	<b>(b)</b> Explain smoke and gas sensor.	<b>04</b>	<b>U</b>	<b>6</b>
	<b>(c)</b> Explain different types of biasing use in transistor.	<b>07</b>	<b>U</b>	<b>6</b>

**OR**

<b>Q.6</b>	<b>(a)</b> Draw block diagram of electronic instrument.	<b>03</b>	<b>R</b>	<b>6</b>
	<b>(b)</b> Write the advantages of transistor and explain why it is called “Bipolar Transistor”.	<b>04</b>	<b>U</b>	<b>6</b>
	<b>(c)</b> Draw diode V-I characteristic and explain forward biasing of pn-junction diode.	<b>07</b>	<b>A</b>	<b>6</b>

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