

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

B. TECH SEMESTER-I, SEMESTER END EXAMINATION – SUMMER 2025

Subject Code: 1CH103

Date: 11-06-2025

**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 - Bloom's Taxonomy Levels (R-Remember, U-Understanding, A –Application, N –Analyze, E – Evaluate, C -Create), CO - Course Outcomes.

SECTION A

	Marks	BL	CO
Q.1 Multiple-Choice Questions	[05]		
(a) The dryness fraction of steam is the ratio of	1	R	2
(i) Mass of vapor to total mass (ii) Mass of liquid to total mass (iii) Volume of vapor to volume of liquid (iv) Pressure of steam to atmospheric pressure			
(b) Boyle's Law states that for a given mass of gas at constant temperature, the volume of gas is	1	R	2
(i) Directly proportional to pressure (ii) Inversely proportional to pressure (iii) Independent of pressure (iv) Directly proportional to temperature			
(c) The RMS (Root Mean Square) value of an AC voltage that has a peak value of 100 V is	1	R	4
(i) 50.5 V (ii) 70.7 V (iii) 100 V (iv) 141.4 V			
(d) KCL states that the algebraic sum of currents entering and leaving a junction is	1	R	4
(i) Always positive (ii) Always negative			

(iii) Zero

(iv) Equal to voltage

(e) In a forward-biased PN junction diode, the potential barrier

1 R 5

(i) Increases

(ii) Decreases

(iii) Remains constant

(iv) Becomes zero

Q.2 Attempt Any Two

[10]

(a) Derive the characteristics equation of a perfect gas with help of Boyle's Law and Charles's Law

5 A 2

(b) What is adiabatic process? Prove the governing law with usual notations.

5 A 2

(c) List out types of calorimeters. Explain anyone of them with a neat sketch.

5 U 2

Q.3 Attempt Any Two

[10]

(a) Define following terms in connection with A.C wave forms: (i) Frequency (ii) Phase difference (iii) Time Period (iv) Form Factor (v) Power Factor

5 R 4

(b) State and explain Kirchhoff's voltage and current laws.

5 U 4

(c) Explain plate earthing with diagram.

5 U 4

Q.4 Attempt Any Two

[10]

(a) Explain the construction, working principle and application of P-N junction diode.

5 U 5

(b) Explain the construction, working and application of Wheatstone bridge.

5 U 5

(c) Draw and explain V-I characteristic of P-N junction diode.

5 U 5

SECTION B

	Marks	BL	CO
Q.5 Multiple-Choice Questions	[05]		
(a) The unit of energy is	1	U	1
<div>(i) Watt</div> <div>(ii) Joule</div> <div>(iii) Joule-meter</div> <div>(iv) Joule per second</div>			
(b) A device used to empty the boiler, when required and to discharge the mud, scale or sediments collected at the bottom of the boiler, is known as:	1	U	3
<div>(i) Safety valve</div> <div>(ii) Stop valve</div> <div>(iii) Fusible Plug</div> <div>(iv) Blow off cock</div>			
(c) The process of filling the liquid into the suction pipe and the pump casing up to the level of the delivery valve is called _____.	1	R	3
<div>(i) filling</div> <div>(ii) pumping</div> <div>(iii) leveling</div> <div>(iv) priming</div>			
(d) In a refrigeration cycle, heat is rejected by the refrigerant in a	1	R	3
<div>(i) expansion valve</div> <div>(ii) condenser</div> <div>(iii) evaporator</div> <div>(iv) compressor</div>			
(e) Permanent deformation of material with respect to time due to constant load and variable temperature is termed as _____	1	R	3
<div>(i) ductility</div> <div>(ii) creep</div> <div>(iii) hardness</div> <div>(iv) isotropy</div>			
Q.6 Attempt Any Two	[10]		
(a) Define: 1) Strength, 2) Elasticity 3) Stiffness 4) Plasticity 5) Malleability	5	R	3
(b) Justify with usual notations that $C_p - C_v = R$.	5	E	1
(c) In a compressor process 3 kJ of mechanical work is supplied to 5kg of working substance. The heat rejected to the cooling jacket is 500 J. Calculate the change in specific energy.	5	A	1
Q.7 Attempt Any Two	[10]		
(a) Explain about Cochran Boiler with neat sketch.	5	U	3
(b) Compare fire tube boilers with water tube boiler.	5	N	3

(c) Explain Vapour Absorption Refrigeration (VAR) system with neat sketch	5	U	3
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Q.8 Attempt Any Two	[10]
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(a) Explain about factors Affecting the Performance of Vapour Compression Refrigeration System	5	U	3
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(b) Explain working of single acting reciprocating pump with neat sketch.	5	U	3
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(c) Compare centrifugal pump and reciprocating pump.	5	N	3
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