Enrolment No/Seat No.: _____

R.N.G.PATEL INSTITUTE OF TECHNOLOGY-RNGPIT

(An Autonomous College U/s UGC Act 1956)

B.Tech. SEMESTER-I, SEMESTER END EXAMINATION - WINTER 2024

Subject Code: 1CH103 **Date: 21-12-2024**

Subject Name: FUNDAMENTALS OF MECHANICAL & 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	**Objective-Type Questions**	**[05]**		
(a)	What is the unit of Resistor?	**1**	**R**	**5**
	(i) Ohm (Ω) **(ii)** Farad (F)			
	(iii) Henry (H) **(iv)** Coulomb (C)			
(b)	PV^n = C represents constant temperature process, when value of n is _____	**1**	**R**	**2**
	(i) n **(ii)** 0			
	(iii) γ **(iv)** 1			
(c)	Saturation Temperature of steam increase _____	**1**	**R**	**2**
	(i) With decrease in pressure **(ii)** With increase in pressure			
	(iii) is unaffected by pressure **(iv)** none of these			
(d)	Ohm's law is not applicable to _____	**1**	**R**	**4**
	(i) DC circuits **(ii)** High currents			
	(iii) Small resistor **(iv)** Semi-Conductors			

(e)	How does the voltage across each branch in a parallel circuit compare to the total voltage? **(i)** Less than the total voltage **(ii)** Greater than the total voltage **(iii)** Equal to the total voltage **(iv)** Zero	**1**	**U**	**4**

Q.2 Attempt Any Two **[10]**

(a)	Explain with usual notations prove that Cp – Cv = R.	**5**	**A**	**2**
(b)	Explain isothermal process. Derive the expression for work done, change in internal energy, change in enthalpy and heat transfer.	**5**	**A**	**2**
(c)	Determine amount of heat is required to produce 7 kg of steam at a pressure of 6 bar and temperature of 250 °C from water at 35 °C. Take C_{ps} = 2.1 KJ/Kg K.	**5**	**A**	**2**

Q.3 Attempt Any Two **[10]**

(a)	List out types of calorimeters. Explain Separating calorimeter of them with a neat sketch.	**5**	**U**	**2**
(b)	Define following terms in connection with A.C wave forms : (i) Frequency (ii) Time Period (iii) R.M.S. Value (iv) Average Value (v) Power Factor	**5**	**R**	**4**
(c)	State and explain Kirchhoff's voltage and current laws.	**5**	**U**	**4**

Q.4 Attempt Any Two **[10]**

(a)	Explain construction of cable in detail.	**5**	**U**	**4**
(b)	Explain the construction, working principle and application of P-N junction diode.	**5**	**U**	**5**
(c)	Discuss forward and reverse bias operation of a P-N junction diode with depletion region.	**5**	**U**	**5**

SECTION B

		Marks	BL	CO
Q.5	**Objective-Type Questions**	**[05]**		
(a)	Prime mover is a device which converts natural resources into _____ energy.	**1**	**U**	**1**
	(i) nuclear energy **(ii)** mechanical energy			
	(iii) potential energy **(iv)** kinetic energy			
(b)	Which of the following is correct?	**1**	**U**	**1**
	(i) Absolute pressure = Gauge pressure + Atmospheric pressure			
	(ii) Gauge pressure = Absolute pressure + Atmospheric pressure			
	(iii) Atmospheric pressure = Absolute pressure + Gauge pressure			
	(iv) Absolute pressure = Gauge pressure - Atmospheric pressure			
(c)	Which one is the water tube boiler?	**1**	**U**	**3**
	(i) Cochran boiler **(ii)** Lancashire boiler			
	(iii) Babcock Wilcox boiler **(iv)** None of these			
(d)	For a domestic refrigerator, the COP is	**1**	**U**	**3**
	(i) more than 1 **(ii)** less than 1			
	(iii) equal to 1 **(iv)** unpredictable			
(e)	The advantage of double-acting reciprocating pump over a single acting pump is	**1**	**U**	**3**
	(i) gives clean water **(ii)** gives uniform discharge			
	(iii) consumes more power **(iv)** it has less friction loss			
Q.6	**Attempt Any Two**	**[10]**		
(a)	Define the following terms 1. Closed system 2. Open system 3. Intensive Properties 4. Extensive Properties 5. Process.	**5**	**U**	**1**
(b)	Differentiate between heat and work.	**5**	**U**	**1**

(c)	30 people attend a party in a small room of size 5m × 10m × 3m. Each person gives about 400 kJ of heat per hour. Assuming the room to be completely sealed and insulated, calculate the air temperature rise within 15 minutes. Assume for air, C_v= 0.718 kJ/kg. *K* and *R* = 0.287 kJ/kg. *K*. Each person occupies a volume of 0.07 m^3 and initial room conditions are 1 bar at 20^0C.	**5**	**N**	**1**

Q.7 Attempt Any Two **[10]**

(a)	State the requirements of a good boiler.	**5**	**A**	**3**
(b)	Compare centrifugal pump and reciprocating pump.	**5**	**U**	**3**
(c)	Define following terms: 1 Strength, Elasticity, 2. Stiffness, 3. Plasticity, 4. Malleability. 5. Ductility,	**5**	**R**	**3**

Q.8 Attempt Any Two **[10]**

(a)	Explain Vapour Absorption Refrigeration (VAR) system with neat sketch.	**5**	**U**	**3**
(b)	Explain window air-conditioning system with neat sketch.	**5**	**U**	**3**
(c)	List out the boiler mounting. Explain anyone of them with neat sketch.	**5**	**R,U**	**3**

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