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

B.Tech. SEMESTER-III, SEMESTER END EXAMINATION – WINTER 2025

SUBJECT CODE: 1EL304	**DATE: 23-12-2025**
SUBJECT NAME: ANALOG AND DIGITAL ELECTRONICS	
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

			Marks	BL	CO
Q.1	**(a)**	What is comparator? Explain the use of op-amp as a zero crossing detector.	03	R	3
	(b)	Explain working of Schmitt trigger with necessary circuit diagram & Waveforms.	04	U	3
Q.2	**(a)**	Illustrate Difference between combinational logic circuit and sequential logic circuit.	03	U	5
	(b)	Show the operation of S-R Flip-Flop with circuit diagram and truth table.	04	R	5
	(c)	Construct serial in parallel out shift register, explain its working also give classification of the various types of shift registers.	07	A	5

OR

			Marks	BL	CO
Q.2	**(a)**	Illustrate Difference between level triggering and edge triggering of flip-flops.	03	U	5
	(b)	Show the operation of J-K Flip-Flop with circuit diagram and truth table.	04	R	5
	(c)	Build 4 – bit synchronous up - counter (Use T flip-flop).	07	A	5
Q.3	**(a)**	Define following specifications of DAC: Resolution, Accuracy, Settling time	03	R	6
	(b)	Explain sample and hold circuit.	04	U	6
	(c)	Explain D/A converter with binary weighted resistors.	07	U	6

<div align="center">**OR**</div>

Q.3	**(a)**	List the applications of DAC and ADC.	**03**	**R**	**6**
	(b)	Compare various DAC techniques.	**04**	**U**	**6**
	(c)	Explain working of successive-approximation register A/D converter.	**07**	**U**	**6**

<div align="center">## SECTION B</div>

			Marks	**BL**	**CO**
Q.4	**(a)**	Define an operational amplifier and list its ideal characteristics.	**03**	**U**	**1**
	(b)	Explain the working of a differential amplifier and its importance in the input stage of an op-amp.	**04**	**N**	**1**
Q.5	**(a)**	Draw and explain the working of an inverting amplifier using op-amp.	**03**	**U**	**2**
	(b)	Describe the Wien bridge oscillator using an op-amp with a diagram and give its frequency formula.	**04**	**U**	**2**
	(c)	What is an instrumentation amplifier? Explain its construction and derive the formula for total gain.	**07**	**R**	**2**

<div align="center">**OR**</div>

Q.5	**(a)**	Draw and explain the working of a non-inverting amplifier using op-amp with a neat diagram.	**03**	**U**	**2**
	(b)	Explain the operation of a differential amplifier and state its applications.	**04**	**U**	**2**
	(c)	Explain the op-amp differentiator circuit. Derive the output voltage equation and discuss its practical limitations.	**07**	**R**	**2**
Q.6	**(a)**	Simplify the Boolean expression using Boolean algebra: $F=A'B+AB'+AB$	**03**	**A**	**4**
	(b)	Design a 2 to 4 decoder and explain its working with a logic diagram.	**04**	**A**	**4**
	(c)	Design and explain an 4-to-1 multiplexer using logic gates.	**07**	**E**	**4**

<div align="center">**OR**</div>

Q.6	**(a)**	Apply your knowledge of digital logic to explain the function and application of a digital comparator.	**03**	**A**	**4**
	(b)	Simplify the Boolean function $F(A,B,C)=\Sigma(1,2,3,5,7)$ using K-map.	**04**	**A**	**4**
	(c)	Design a binary-to-Gray code converter using logic gates and explain its working with truth table.	**07**	**E**	**4**

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