Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III EXAMINATION – SUMMER 2025

Subject Code:3132003 Date:31-05-2025

Subject Name:Design Concepts in Basic Electronics

Time:02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Convert the decimal number 42 to binary, octal, and hexadecimal.	**03**
	(b)	Write the Gray Code sequence for the numbers 0 to 7 in binary.	**04**
	(c)	Convert the binary number **11011011** to Gray Code, Excess-3, and hexadecimal.	**07**
Q.2	**(a)**	State and prove De Morgan's Theorem.	**03**
	(b)	Simplify the Boolean expression AB+A'B using Boolean laws.	**04**
	(c)	Design a 4-to-1 Multiplexer using basic gates. Explain its working with a truth table and provide its Boolean expression.	**07**
		OR	
	(c)	Explain a 3-to-8 Decoder circuit with its truth table and applications.	**07**
Q.3	**(a)**	What is the difference between synchronous and asynchronous counters?	**03**
	(b)	Explain the working of a 3-bit asynchronous (ripple) counter. Draw its circuit diagram and truth table.	**04**
	(c)	Describe the design and operation of a Serial In/Serial Out (SISO) and Serial In/Parallel Out (SIPO) shift register. Draw circuit diagrams and timing diagrams to illustrate the differences.	**07**
		OR	
Q.3	**(a)**	Describe the difference between a shift register and a counter.	**03**
	(b)	Describe the timing delay issue in asynchronous counters and explain why it occurs.	**04**
	(c)	Explain the working of a J-K flip-flop with a circuit diagram, truth table, and timing diagram. Discuss how it handles the race condition.	**07**
Q.4	**(a)**	Explain the key features of TTL (Transistor-Transistor Logic).	**03**
	(b)	Describe the basic circuit of RTL (Resistor-Transistor Logic) and discuss its main application.	**04**
	(c)	Discuss the performance characteristics of digital logic families.	**07**
		OR	
Q.4	**(a)**	Define an intrinsic semiconductor and give one example.	**03**
	(b)	Describe how a diode behaves in forward bias and reverse bias conditions.	**04**
	(c)	Explain the impact of doping on the energy levels of semiconductors.	**07**
Q.5	**(a)**	What is a clipper circuit? Give one practical example of its use.	**03**
	(b)	What is the purpose of a choke-input filter? Explain how it affects the output voltage ripple.	**04**
	(c)	Compare half-wave, full-wave center-tapped, and bridge rectifiers in terms of efficiency, PIV, ripple frequency, and transformer requirements.	**07**

OR

Q.5	**(a)**	Explain the concept of a load line in a transistor circuit.	**03**
	(b)	Describe the process of reading a transistor data sheet and list at least three important parameters.	**04**
	(c)	Discuss the process of accurately analyzing a Voltage-Divider Bias circuit.	**07**

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