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Total Number of Pages: 02

Course: B.Tech

Sub_Code: RBM4C001/REE4C001/REL4C001

4th Semester Back Examination: 2025-26

SUBJECT: Digital Electronics

BRANCH(S): BIOMED, EEE, ELECTRICAL

Time: 3 Hours

Max Marks: 100

Q.Code: S275

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- Differentiate between signed and unsigned binary numbers.
- Perform the following binary arithmetic: (I) $1101 + 1011$, (II) $10101 - 1101$
- Convert the decimal number 2455.30 to its binary equivalent.
- What are error detecting and correcting codes?
- What is the purpose of the "don't care" condition in Karnaugh maps?
- What is the function of a priority encoder in digital circuits?
- Design NAND gate and XOR gate using 2 - input NOR gate.
- Describe the operation of tri-state logic and its applications
- Explain the difference between TTL and CMOS logic families.
- How many flip-flops are required to build a binary counter that counts from 0 to 4095?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Simplify the Boolean expression: $(A + B)(A' + C)(B + C')$ using Boolean algebra.
- Explain the operation of an 8:1 multiplexer. Draw its logic diagram and truth table.
- Design a JK flip-flop using NAND gates. Explain its operation with a truth table and timing diagram.
- What is a decoder? Design a 3-to-8 line decoder and explain its operation.
- Design a 4-bit parallel adder using full adders. Explain its operation and timing diagram.
- Simplify the Boolean expression $F(A, B, C) = A'BC + AB'C + ABC'$ using a Karnaugh map.
- What is an Analog-to-Digital Converter (ADC)? Explain the operation of a successive approximation ADC with a block diagram.
- Design a sample and hold circuit. Explain its operation and applications.
- What is a ring counter? Design a 4-bit ring counter and explain its operation.
- Explain the operation of a weighted resistor Digital-to-Analog Converter (DAC).
- What is a Programmable Logic Array (PLA)? Explain its structure and programming.
- Discuss the interfacing of CMOS and TTL logic families with suitable examples.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

(16 x 2)

- Q3** a) Design a 4-bit binary adder using logic gates. **(8 + 8)**
b) Implement an XOR gate using only NAND gates.
- Q4** a) Implement the Boolean function $F(A, B, C, D) = \Sigma(0, 1, 2, 4, 8, 9, 15)$ using a 4-to-1 multiplexer. **(8 + 8)**
b) Define sequential circuits. Explain the operation of a clocked SR flip-flop with its truth table and timing diagram
- Q5** a) What is a shift register? Design a 4-bit serial-in serial-out (SISO) shift register and explain its operation. **(8 + 8)**
b) Explain the operation of a 4-bit ripple counter. Draw its logic diagram and timing diagram.
- Q6** a) Define Field Programmable Gate Array (FPGA). Discuss its architecture and applications **(8 + 8)**
b) Explain the concept of charge-coupled device (CCD) memory. Discuss its advantages and disadvantages.