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**BTECH**  
**(SEM IV) THEORY EXAMINATION 2024-25**  
**DIGITAL ELECTRONICS**

**TIME: 3 HRS****M.MARKS: 100****Note:** Attempt all Sections. In case of any missing data; choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

Q No.	Question	CO	Level
a.	What is a “don’t care” condition in Karnaugh Map simplification?	1	K2
b.	Convert the decimal number -27 into 8-bit 2’s complement binary.	1	K3
c.	What is the basic difference between a multiplexer and a decoder?	2	K2
d.	List two applications each of encoder and demultiplexer.	2	K2
e.	Define the characteristic equation of a JK flip-flop.	3	K3
f.	What is the role of a shift register in digital systems?	3	K3
g.	What is the difference between synchronous and asynchronous sequential circuits?	4	K2
h.	What do you mean by “race condition” in asynchronous circuits?	4	K3
i.	What is the difference between static RAM and ROM?	5	K2
j.	Differentiate between PLA and PAL	5	K3

**SECTION B****2. Attempt any three of the following:****10 x 3 = 30**

Q No.	Question	CO	Level
a.	Simplify the following Boolean expression using a 5-variable K-map and implement the simplified expression using only NOR gates: $F(A,B,C,D,E)=\sum m(0,2,8,10,16,18,24,26)$	1	K2
b.	Draw and explain the logic diagram and working of a 4-bit binary adder-subtractor using full adders and XOR gates.	2	K4
c.	Explain the different types of flip-flops (SR, JK, D, T) along with their truth tables and characteristic equations.	3	K4
d.	What is the significance of state assignments?	4	K3
e.	A combinational circuit is defined by the function- $F_1=\sum m(1,5,7)$ $F_2=\sum m(5,6,7)$ Implement the circuit with PLA	5	K4

**SECTION C****3. Attempt any one part of the following:****10 x 1 = 10**

Q No.	Question	CO	Level
a.	Explain (a) signed binary code (b) 1’s complement (c) 2’s complement	1	K2
b.	Simplify the Boolean function using a 4-variable Karnaugh Map and implement the simplified expression using only NAND gates: $F(A,B,C,D)=\sum m(1,3,7,11,15)+d(0,2,5,13)$ Where: <ul style="list-style-type: none"> <li>• m = minterms</li> <li>• d = don’t care conditions</li> </ul>	1	K3



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**4. Attempt any one part of the following: 10 x 1 = 10**

Q No.	Question	CO	Level
a.	Implement a full subtractor using only NAND gates.	2	K2
b.	Use an 8-to-1 multiplexer to implement the Boolean function: $F(A,B,C)=\sum m(1,3,4,6)F(A, B, C)$	2	K4

**5. Attempt any one part of the following: 10 x 1 = 10**

Q No.	Question	CO	Level
a.	Discuss the working of a Johnson counter. How is it different from a ring counter?	3	K3
b.	Convert RS flip flop to D flip flop.	3	K4

**6. Attempt any one part of the following: 10 x 1 = 10**

Q No.	Question	CO	Level
a.	What are the steps for the analysis of asynchronous sequential circuits?	4	K2
b.	Explain hazards in asynchronous sequential circuits. What are static and dynamic hazards? How can they be eliminated?	4	K3

**7. Attempt any one part of the following: 10 x 1 = 10**

Q No.	Question	CO	Level
a.	Explain the interfacing of digital logic families	5	K2
b.	Compare the structure and use cases of PLA, PAL, ROM, and FPGA. When would you choose one over the others in a design problem?	5	K4