

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2025

B.Tech-3rd Semester (IT/MC)

COURSE CODE (CREDITS): 25B11CI314 (3)

MAX. MARKS: 25

COURSE NAME: Digital Systems and Computer Organization

COURSE INSTRUCTORS: Dr. Vivek Kumar Sehgal

MAX. TIME: 1 Hour 30 Min

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

(c) Calculator is not allowed

Q.No	Question	CO	Marks
Q1	(a) Design a 4-bit adder-subtractor using four full-adders and four XOR gates controlled by a single M input ($M = 0$, add, $M = 1$ subtract). Draw a clear logic diagram showing all connections, label inputs A[3:0], B[3:0], SUB, S[3:0], Cout, and the carries between stages. Explain briefly how subtraction is implemented.	CO-1,2	2.5
	(b) Design a look-ahead carry generator for a full adder circuit		2.5
Q2	(a) What is a BCD Adder? Why is it different from a Binary Adder?	CO-2	1
	(b) Draw and explain the working of a BCD adder circuit using two 4-bit binary adders and necessary logic gates.		4
	(i) Explain how correction is applied when the binary sum exceeds 9.		
	(ii) Derive the logic expression for the correction signal.		
Q3.	(a) We need to design a combinational circuit to perform the operation $W = A \cdot B + C$ where: A and B are 2-bit inputs each, C is a 4-bit input, W is a 4-bit output.	CO-2	3
	(b) Explain the functions of encoders and decoders in digital systems. Construct a 4×16 decoder constructed with two 3×8 decoders		2
Q4.	What is the role of a digital multiplexer in a digital circuit, and how does it help in data selection and transmission? Implement the following function with an 8×1 multiplexer: $F(A,B,C,D) = \Sigma(0,1,3,4,8,9,15)$	CO-2,3	5
Q5.	(a) What distinguishes combinational digital circuits from sequential digital circuits? Additionally, list the different types of flip-flops that can be used to store a single binary bit.	CO-3	2
	(b) Draw and explain the working of JK flip flops		3