

**DIGITAL LOGIC DESIGN
(MCAP 1101)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

**Group – A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) _____ register keeps track of the instructions stored in program stored in memory.
(a) AR (Address Register) (b) XR (Index Register)
(c) PC (Program Counter) (d) AC (Accumulator)
- (ii) With 2's complement representation, the range of values that can be represented on the data bus of an 8 bit microprocessor is given by
(a) -128 to 127 (b) -128 to +128
(c) -127 to 128 (d) -256 to 256
- (iii) Which is the major functioning responsibility of the multiplexing combinational circuit?
(a) Decoding the binary information
(b) Generation of all minterms in an output function with OR-gate
(c) Generation of selected path between multiple sources and a single destination
(d) All of the above.
- (iv) How many OR gates are required for a Decimal-to-BCD encoder
(a) 2 (b) 10
(c) 3 (d) 4
- (v) Decoder which takes an n-digit binary number and decodes it into 2ⁿ data lines is called
(a) Pin decoder (b) Line decoder
(c) Row decoder (d) Column decoder.
- (vi) A register is a group of _____
(a) OR gates (b) AND and OR gates.
(c) Flip flops (d) None of the above.

- (vii) The address bus flow in _____
(a) Bidirectional (b) Unidirectional.
(c) Multidirectional (d) Circular
- (viii) Complement of the expression $A'B + CD'$ is _____
(a) $(A' + B)(C' + D)$ (b) $(A + B')(C' + D)$
(c) $(A' + B)(C' + D)$ (d) $(A + B')(C + D')$
- (ix) A product term containing all K variables of the function in either complemented or uncomplemented form is called a _____
(a) Minterm (b) Maxterm
(c) Midterm (d) Σ term
- (x) The number of full and half adders are required to add 16-bit number is _____
(a) 8 half adders, 8 full adders (b) 1 half adders, 15 full adders
(c) 16 half adders, 0 full adders (d) 4 half adders, 12 full adders.

Group – B

2. (a) Write short notes on any one of the following(any two)
(i) Grey code
(ii) BCD code
(iii) Signed and unsigned number
(iv) Excess-3 code.
- (b) Applying Booth's Multiplication algorithm find the product $(-13) \times (+10)$.
 $(3 \times 2) + 6 = 12$
3. (a) Convert the Hexadecimal number to Octal
 $(ABCD35.67)_{16} = (\dots\dots\dots)_8$
- (b) Convert the Grey code to Hexadecimal Number
 $(1110101001111011) = (\dots\dots\dots)_{16}$
 $6 + 6 = 12$

Group – C

4. (a) Simplify the following Boolean function in a sum of product form
 $F(A, B, C, D) = \Sigma(0,1,2,5,8,9,10)$.
- (b) Simplify the following function in tabular method(Quine-McCluskey meyhod)
 $F = \Sigma(0,1,2,8,10,11,14,15)$
 $6 + 6 = 12$
5. (a) Prove that the sum of all minterms of n variables =1.

(b) Simplify the following using K-map method.

$$F = A'B'D' + A'CD + A'BC$$

$$d = A'BC'D + ACD + AB'D'$$

6 + 6 = 12

Group – D

6. (a) Show that a full adder can be expressed as the combination of two half adders.
 (b) Draw the truth table of full subtractor and the corresponding circuit diagram. Draw the XOR gate using NAND gates.

4 + (4 + 4) = 12

7. (a) Draw the block diagram for BCD adder.
 (b) Implement the Boolean function $F = \sum(1,3,5,6)$ using 4X1 MUX.

6 + 6 = 12

Group – E

8. (a) What are the basic differences between combinational circuit and sequential circuit?
 (b) Explain the working functionalities of SR latch with diagram. What is Master-Slave flip flop? Draw the circuit diagram of it.

4 + (4 + 4) = 12

9. (a) Describe the working functionalities of JK flip flop and T flip flop with diagram.
 (b) Briefly explain about shift register.

(4 + 4) + 4 = 12

Department & Section	Submission Link
MCA	https://classroom.google.com/w/Mjg4NDM5MTc2MzEx/tc/Mjk0NDM0NDQ4Nzg4