

MASTER OF COMPUTER APPLICATION  
First Semester  
Digital Logic & Design  
(MCA - 02)

Duration: 3Hrs.

Full Marks: 70

Part-A (Objective) =20

Part-B (Descriptive)=50

(PART-B: Descriptive)

Duration: 2 hrs. 40 mins.

Marks: 50

1. Answer the following questions (any *five*)

2×5=10

a) Divide  $(101101)_2$  by  $(110)_2$

b) Prove that

$$AB+A(B+C)+B(B+C)=B+AC$$

c) What is the octal equivalent of hexadecimal number(B9F.AE)

d) Simplify the given Boolean expression

$$Y=A+\bar{A}B+\bar{A}\bar{B}C+\bar{A}\bar{B}\bar{C}D$$

e) Draw the circuit diagram of full subtractor.

f) Explain the difference between a sequential circuit and combinational circuit.

g) Give the characteristic table and excitation table of SR flip flop.

2. Answer the following questions (any *five*)

3×5=15

a) Realize an OR gate using a) NAND gate and b) NOR gate

b) Given the logic function of three variables

$$f(A, B, C) = A + \bar{B}C. \text{ Express } f \text{ in the standard SOP form.}$$

c) Design 1X4 demultiplexer.

d) Minimize the following function using K-map.

$$F(A, B, C, D) = \sum m(1, 3, 7, 11, 15) + \sum d(0, 2, 5)$$

e) Design 3X8 decoder using 2X4 decoder.

f) Construct T flip flop using SR flip flop.

g) Draw the logic diagram of a 4-bit serial in-parallel-out shift register.

**3. Answer the following questions (any five)**

**5×5=25**

- a) Convert  $(1011)_2$  and  $(101)_2$  into decimal numbers. Multiply them and then convert the result into binary.
- b) Realize following function using 8:1 multiplexer.  
$$Y(A,B,C,D)=ABC+ABD+AB\bar{C}\bar{D}+\bar{A}B\bar{C}D$$
- c) Implement a full adder with two half adders and an OR gate.
- d) Design a counter which counts decimal values  
0, 1, 3,4,5,6
- e) Give the state diagram of J-K flip flop.
- f) Design a four bit binary synchronous counter with D flip flop.
- g) Write short notes on any one of the following
- i) Multiplexer
  - ii) Shift Register
  - iii) MOD-6 synchronous counter.

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*(The figures in the margin indicate full marks for the questions)*

**Duration: 20 minutes**

**Marks – 20**

**PART A- Objective Type**

**Answer all the questions. Each question carries one mark.**

**1×20=20**

**Choose correct or the best alternative in the following.**

1. Radix of binary number system is \_\_\_?  
A) 0  
B) 1  
C) 2  
D) A & B
2. A group of four bits is known as  
A) bit  
B) byte  
C) nibble  
D) word
3. 1's complement representation of decimal number of -17 by using 8 bit representation is  
A) 11101110  
B) 11011101  
C) 11001100  
D) 00010001
4. The Gray code for decimal number 6 is equivalent to  
A) 1100  
B) 1001  
C) 0101  
D) 0110
5. The binary equivalent of octal number (367.52) is  
A) 010101111.101010  
B) 011110111.101010  
C) 111100111.101010  
D) 111110111.101010
6. The hexadecimal number 'A0' has the decimal value equivalent to  
A) 80  
B) 256  
C) 100  
D) 160
7. The NAND gate output will be low if the two inputs are  
A) 00  
B) 01  
C) 10  
D) 11
8. DeMorgan's first theorem shows the equivalence of  
A) OR gate and Exclusive OR gate.  
B) NOR gate and Bubbled AND gate.  
C) NOR gate and NAND gate.  
D) NAND gate and NOT gate.

