

**37 (Sem-1) IT/MCA 1.3**

**2 0 1 1**

**IT/MCA**

Paper : 1.3

**( Digital Logic )**

Full Marks : 100

Time : 3 hours

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

1. Multiple choice questions (one of the four options in each question is correct, choose the correct one) : 1×10=10

(a) An octal number system uses

- (i) eight digits
- (ii) two digits
- (iii) seven digits
- (iv) sixteen digits

(b) MIPS stands for

- (i) Million Inputs Per Storage
- (ii) Million Instructions Per Sequence
- (iii) Million Instructions Per Set
- (iv) Million Instructions Per Second

(c) The 2's complement of  $1001_{(2)}$  is

(i) 0010

(ii) 0111

(iii) 1111

(iv) 0101

0110

(d) The parity bit is used for

(i) error controlling

(ii) indexing

(iii) error checking

(iv) coding

(e) POS stands for

(i) Product on Sum

(ii) Product Output Sum

(iii) Product of All Sum

(iv) Product of Sum

(f) Any combination logic circuit can be implemented by using the following universal building block

(i) AND

(ii) NAND

(iii) OR

(iv) NOT

(g) Hexadecimal equivalent of  $(56)_{10}$  is

(i) 34

(ii) 78

(iii) 30

~~(iv)~~ 38

(h) 'One input and many outputs' is the characteristic of

(i) multiplexer

~~(ii)~~ demultiplexer

(iii) flip-flop

(iv) decoder

(i) Boolean addition is same as the logical

(i) XOR addition

~~(ii)~~ OR addition

(iii) NOR addition

(iv) AND addition

(j) Combinational circuit that performs the action of binary addition is

(i) multiplexer

(ii) decoder

~~(iii)~~ code converter

~~(iv)~~ adder

2. State whether the following statements are True or False : 1×10=10

- T (a) Binary number system is used in digital computers.
- T (b) Octal number system is positional number system.
- F (c) A mainframe computer cannot act as a database server.
- T (d) Binary equivalent octal number 26 is 11110.
- T (e) Hexadecimal equivalent binary number 1111010 is 7A.
- F (f) An electronic combinational circuit which performs the arithmetic addition of two binary digits is called a full adder.
- T (g) A toggle flip-flop changes state on every tick of the clock.
- T (h) The basic multiplexer has a single data input line and several output lines.
- F (i) The exclusive NOR gate is negation of XOR gate.
- T (j) An encoder is a digital function that produces a reverse operation from that of a decoder.

3. Fill in the blanks :

1×10=10

- (a) A binary number with 4 bits is called —.
- (b) A computer is an —.
- (c) The operation of making the output state opposite to that of the input is called —.
- (d) Decimal equivalent of binary 11100 is —. 28
- (e) Binary equivalent of hexadecimal number AB is —. 1010 1011
- (f) 2-variable K-map contains  $\frac{4}{}$  cells.
- (g) The NAND gate is quite — in its use.
- (h) Boolean addition is same as the logical ~~or~~ operation.
- (i) A combination of NOT and OR gates is termed as ~~NOR~~
- (j) An encoder is a combinational logic circuit that converts an active input signal into a —.

## 4. Match Column—A with Column—B : 1×10=10

Column—A	Column—B
(a) Microcomputers work faster like <u>ii</u>	(i) Alphanumeric code
(b) The logical inverse operation is also called <u>vi</u>	(ii) Flip-flop
(c) Base eight systems <u>v</u>	(iii) Demultiplexer
(d) ASCII code <u>xi</u>	(iv) Minicomputers
(e) One input and many outputs <u>ix</u>	(v) Octal number system
(f) Universal logic gate <u>xiii</u>	(vi) Multiplexer
(g) Karnaugh map <u>xii</u>	(vii) NOT operation
(h) The decoding of data is needed by many <u>xiv</u>	(viii) NAND/NOR
(i) Many inputs and one output <u>xv</u>	(ix) Digital systems
(j) Two cross coupled NOR gates <u>ii</u>	(x) Decoder
	(xi) Complex Boolean function
	(xii) Simplify function
	(xiii) Product
	(xiv) Binary number

## 5. Answer the following : 3×10=30

- (a) Explain the binary-number system.
- (b) How is a hexadecimal number represented?
- (c) What are OR and AND gates?
- (d) What are NAND and NOR gates?

- (e) Find the binary equivalent of the decimal number 128.
- (f) When is the output of an OR gate high?
- (g) What is flip-flop? Explain.
- (h) What is a half-adder? Explain.
- (i) What are the main components of CPU?
- (j) What is the difference between multiplexer and demultiplexer?

Answer any *two* from the following :

6. (a) Perform the following operations :  $3 \times 3 = 9$

(i) Find the octal equivalent of 100110101.

(ii) Find the hexadecimal equivalent of 100110101.

(iii) Convert the decimal 123 to base-8 system.

(b) Explain how AND, OR and NOT operations can be obtained using only NAND gate. 6

7. (a) Simplify the following expression using K-map : 6

(i)  $Y = AB + AB' + A'B'$

(ii)  $Y = A'BC + A'BC' + AB'C' + AB'C$

(b) Write the truth tables of the following Boolean expressions and draw their logic diagrams : 9

(i)  $Y = A'B'C + A'BC + AB'$

(ii)  $Y = AB' + A'C$

(iii)  $Y = A'B'C + A'BC + AB'$

8. (a) What are decoders and how are they different from encoder? Draw the logic diagram and truth table of a 3-to-8 line decoder. 6

(b) Explain with the help of a circuit diagram the principle of half-subtractor and full-subtractor. 9

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