

KATHMANDU UNIVERSITY  
End Semester Examination [C]  
November/December, 2023

Marks Scored:

Level : B.E./B.Sc.

Year : II

Exam Roll No. :

Time: 30 mins.

Course : EEG 202

Semester : I

F. M. : 10

Registration No.:

Date 27: NOV 2023

SECTION "A"

[20 Q. × 0.5 = 10 marks]

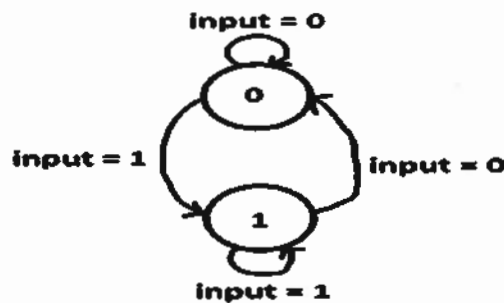
Choose and encircle the most appropriate option. Symbols have their usual meaning.

- The given hexadecimal number  $(1E.53)_{16}$  is equivalent to \_\_\_\_\_  
a.  $(63.32)_8$       b.  $(12.46)_8$       c.  $(98.24)_8$       d.  $(36.24)_8$
- Which of the following digital logic circuits can be used to add more than 1-bit simultaneously?  
a. Full adder      b. Ripple carry adder  
c. Half adder      d. Serial adder
- The  $(r-1)$ 's complement of  $(0.1101)_2$  is \_\_\_\_\_  
a.  $(0.0010)_2$       b.  $(0.1010)_2$       c.  $(0.1110)_2$       d.  $(0.0001)_2$
- The number of control lines for a 1 to 4 demultiplexer is \_\_\_\_\_  
a. 2      b. 3      c. 4      d. 5
- How many Flip-Flops are required for mod-10 counter?  
a. 6      b. 5      c. 3      d. 4
- The binary code for Gray code 1011 is equivalent to \_\_\_\_\_  
a. 0101      b. 1010      c. 1101      d. 1111
- If  $x$  is a Boolean variable then,  $x + x$  equals to \_\_\_\_\_  
a.  $2x$       b. 0      c. 1      d.  $x$
- The digital logic family which has minimum power dissipation is \_\_\_\_\_  
a. TTL      b. RTL      c. DTL      d. CMOS
- Which of the following is universal gate?  
a. AND      b. OR      c. NAND      d. NOR
- The BCD sum of two binary numbers, 0100 and 1000 is \_\_\_\_\_  
a. 1100      b. 10010      c. 10111      d. 10011
- If  $A$  and  $B$  are inputs to the two input X-NOR gate, which of the following expression for output is correct?  
a.  $\bar{A}B + A\bar{B}$       b.  $\bar{A}\bar{B} + A\bar{B}$       c.  $\bar{A}B - A\bar{B}$       d.  $\bar{A}\bar{B} + AB$
- The device which changes from serial data to parallel data is \_\_\_\_\_  
a. Encoder      b. Decoder      c. Multiplexer      d. Demultiplexer

13. A mod-12 up counter counts up to \_\_\_\_\_  
 a. 11                      b. 12                      c. 10                      d. 13
14. For SR flip flop with  $S=1, R=0$ , the output after clock pulse will be \_\_\_\_\_  
 a. Low                      b. High  
 c. No change              d. Complement of previous state
15. Flip-flops are memory device which store \_\_\_\_\_  
 a. one bit of information              b. two bit of information  
 c. three bit of information              d. more than two bits of information
16. Which of the following expression is correct for the given K-Map?

AB\CD	00	01	11	10
00	1	1	1	1
01	0	0	0	0
11	0	0	0	0
10	0	0	0	0

- a.  $\bar{A}\bar{B}$                       b.  $A\bar{B}$                       c.  $AB$                       d.  $\bar{A}B$
17. Which of the following represents the characteristic equation of JK flip flop?  
 a.  $Q(\text{next}) = JQ' + K'Q$               b.  $Q(\text{next}) = J'Q' + K'Q$   
 c.  $Q(\text{next}) = JQ' + K'Q'$               d.  $Q(\text{next}) = J'Q' + K'Q'$
18. The figure below represents the state transition diagram of \_\_\_\_\_



- a. SR flip-flop              b. JK flip-flop              c. T flip-flop              d. D flip-flop
19. An encoder converts binary information from  $2^n$  input lines to a maximum \_\_\_\_\_ unique output lines.  
 a.  $2n$                       b.  $n^2$                       c.  $n$                       d.  $2^{n-1}$
20. A  $N$  bit shift register requires \_\_\_\_\_ flip-flops.  
 a.  $N$                       b.  $2N$                       c.  $N^2$                       d.  $N+1$

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Semester : I  
F. M. : 40

**SECTION "B"**

[4 Q. × 10 = 40 marks]

Attempt *ANY FOUR* questions. Calculators are not allowed.

1.
  - a. Using K-map method, simplify the following Boolean function in (i) sum of products (ii) product of sums: [5]  
 $F(A, B, C, D) = \sum (0, 1, 2, 5, 8, 9, 10)$
  - b. Using r's complement, perform the following subtraction: [2]  
 $(3250 - 72532)_{10}$
  - c. Express the following Boolean function  $F = A + B'C$  in product of maxterms. [3]
2.
  - a. Draw a logic circuit for octal to binary encoder. [5]
  - b. Write truth table and design logic circuit for 3-bit odd parity checker. [5]
3.
  - a. Derive the characteristic equation of JK flip-flop and convert the D flip-flop into JK flip-flop with the help of excitation table. [2+3]
  - b. Design a logic circuit for mod-6 synchronous up/down counter and explain the working mechanism with the help of timing diagram. [5]
4.
  - a. Explain the working of bidirectional shift register with circuit diagram. [5]
  - b. A sequential circuit has two T flip-flops A and B, one input X and output Y. The circuit is described by the following flip-flop input output equations: [5]  
 $T_A = BX$ ,  $T_B = X$  and  $Y = AB$ . Draw the state table and state diagram of the circuit.
5.
  - a. Design a logic circuit having four inputs A, B, C, D whose output is low whenever both A and B are high as long as C and D are either both low or both high. [5]
  - b. Write short notes on: [2.5 × 2 = 5]
    - i. Ring counter
    - ii. Master slave JK flip-flop

