

KATHMANDU UNIVERSITY  
End Semester Examination [C]  
June, 2018

Level : B.E./B. Sc.

Course : EEG 202

Year : II

Semester: I

Exam Roll No. :

Time: 30 mins

F. M. : 20

Registration No.:

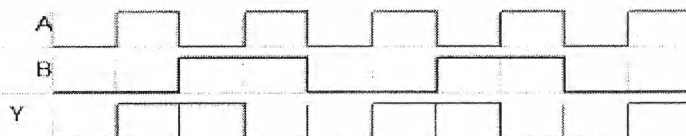
Date :

JUN 15 2018

SECTION "A"  
[20 × 0.5 = 10 marks]

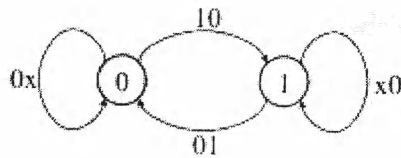
Choose the most appropriate option. Symbols have their usual meaning.

- The binary equivalent of decimal number 0.625 is .....  
a. 0.101                      b. 0.110                      c. 0.111                      d. 0.100
- If A and B are inputs to a two input logic gate and Y is the output of the gate then which of the gate corresponds to the following output waveform?



- AND                      b. OR                      c. X-OR                      d. X-NOR
- If A and B are inputs to the two input X-OR gate, which of the following expression for output is correct?  
a.  $\overline{A}B + A\overline{B}$                       b.  $\overline{A}\overline{B} + A\overline{B}$                       c.  $\overline{A}B - A\overline{B}$                       d.  $\overline{A}\overline{B} + AB$
  - Which of the following Boolean postulate is true?  
a.  $X + X = 2X$                       b.  $X + X = 0$                       c.  $X + X = 1$                       d.  $X + X = X$
  - Which of the following represents the DeMorgan's law?  
a.  $\overline{A + B} = \overline{A} + \overline{B}$                       b.  $\overline{A + B} = A + B$                       c.  $\overline{A + B} = A.B$                       d.  $\overline{A + B} = \overline{A}.\overline{B}$
  - 10's complement of decimal number 012398 is given by  
a. 12398                      b. 02231                      c. 32154                      d. 033216
  - Which of the following expression represents the Boolean function  $F = A + B'C$  in sum of min terms  
a.  $F(A,B,C) = \sum(0,2,3,4,5)$                       b.  $F(A,B,C) = \sum(1,4,5,6,7)$   
c.  $F(A,B,C) = \sum(1,3,5,6,7)$                       d.  $F(A,B,C) = \sum(2,4,5,6,7)$
  - Which of the following is universal gate?  
a. AND                      b. OR                      c. AND                      d. NAND
  - If the input to T-flipflop is 100 Hz signal, the final output of the three T-flipflops in cascade is  
a. 12.5 Hz                      b. 20.5 Hz                      c. 27.5 Hz                      d. 48.5Hz
  - The device which changes from serial data to parallel data is  
a. Encoder                      b. Decoder                      c. Multiplexer                      d. Demultiplexer

11. A mod-N counter counts up to  
 a. N                                      b.  $2^N$                                       c. N-1                                      d. N+1
12. Shifting a register content to left by one bit position is equivalent to  
 a. Division by two                                      b. Subtraction by two  
 c. Addition by two                                      d. Multiplication by two
13. A device which converts BCD to Seven Segment is called  
 a. Encoder                                      b. Decoder                                      c. Multiplexer                                      d. Demultiplexer
14. The characteristic equation for the T flip flop is given by  
 a.  $Q(t+1) = T\bar{Q} + \bar{T}Q$                                       b.  $Q(t+1) = T\bar{Q} + TQ$   
 c.  $Q(t+1) = Q\bar{T} + \bar{T}Q$                                       d.  $Q(t+1) = \bar{T}\bar{Q} + TQ$
15. The following figure represents the state transition diagram of



- a. SR flip-flop                                      b. D flip-flop                                      c. T flip-flop                                      d. JK flip-flop
16. For JK flip flop with J=1, K=0, the output after clock pulse will be  
 a. Low                                      b. High                                      c. No change                                      d. Complimented
17. While implementing a Boolean function having N variables, the number of selection lines for a multiplexer is equal to  
 a. N                                      b.  $N^2$                                       c. 2N                                      d. N-1
18. In general,  $2^K \times N$  ROM requires .....decoders.  
 a.  $N \times 2^N$                                       b.  $K \times 2^K$                                       c.  $N \times 2^K$                                       d.  $K \times 2^N$
19. Which of the following is universal gate?  
 a. AND                                      b. OR                                      c. NAND                                      d. NOR
20. Which of the following binary combination represents the result of BCD addition of two BCD numbers 1000 and 1001?  
 a. 10001                                      b. 01110                                      c. 10111                                      d. 10110

SECTION "B"

[5 Q. × 11 = 55 marks]

Attempt *ANY FIVE* questions. Figure in the margin indicates the full mark. Students are required to answer in their own words as far as practicable. **Calculators are not allowed.**

1.
  - a) What is a reflected code? Design a logic circuit for 3 bit odd parity generator. [5]
  - b) Express the Boolean function,  $F = A + \bar{B}C$  in a sum of minterms. [3]
  - c) Perform the subtraction on the following unsigned binary numbers using the 2's complement of the subtrahend. (a)  $11011 - 11001$  (b)  $101010 - 101011$  [3]
2.
  - a) Design a BCD-to-excess-3 code converter using combinational logic. [5]
  - b) Design a mod-8 synchronous down counter and explain the operation using the timing diagram. [4+2]
3.
  - a) Simplify the following Boolean function using K-map  
 $F(w,x,y,z) = \sum(1,3,7,11,15)$  which has the don't care conditions  
 $d(w,x,y,z) = \sum(0,2,5)$  [4]
  - b) Implement the following 4-input Boolean function with a Multiplexer  
 $F(A,B,C,D) = \sum(1,3,4,11,12,13,14,15)$  [4]
  - c) Explain differences between combinational and sequential circuit with example. [3]
4.
  - a) Write some applications of flip-flops. With the help of excitation table, convert D flip-flop into JK flip-flop. [2+4]
  - b) Explain shift register and types of shift register. Construct a 4-bit Johnson counter with state table. [2 + 3]
5.
  - a) Explain the special characteristics of IC digital logic families [4]
  - b) Implement the following Boolean function with NOR and NAND gate [4]  
$$F(x, y, z) = \sum(1,2,3,4,5,7)$$
  - c) A combinational circuit is defined by the following three functions:  
$$F_1 = x'y' + xyz'$$
$$F_2 = x' + y$$
$$F_3 = xy + x'y'$$

Design the circuit with a decoder and external gates. [3]

6.

- a) Design a serial adder using a sequential-logic procedure. [4]
- b) How can we use decoder as a demultiplexer? [2]
- c) Draw the state table and state diagram of the following synchronous sequential circuit (Figure 1) where  $x$  represents the input and  $A, B$  represent the states of the flip-flops. [5]

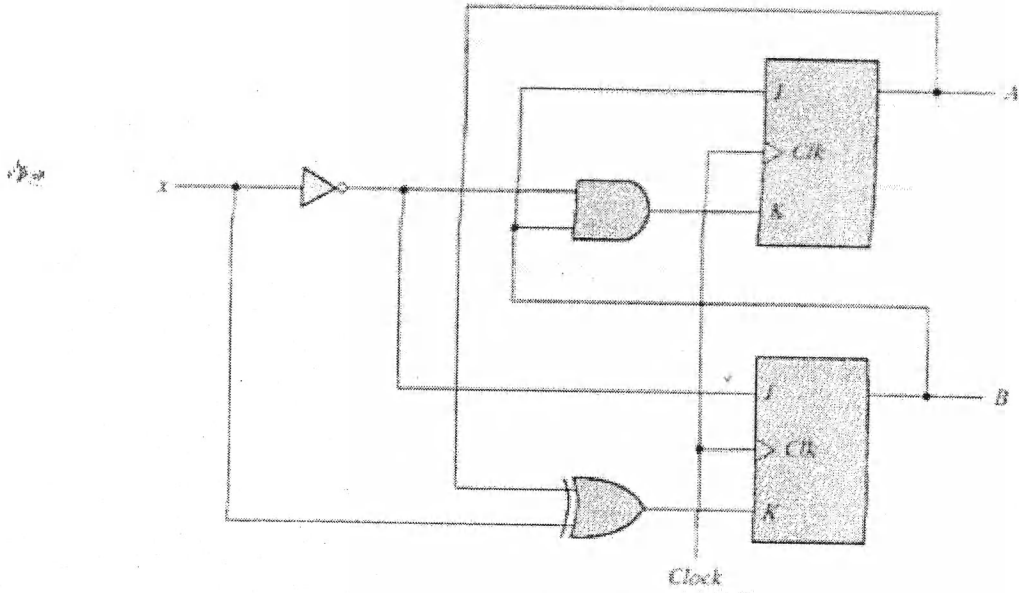


Figure 1.