

Name of Course : **B. Sc. Hons. Physics - CBCS_Core**
Semester : **III-Semester**
Name of Paper : **Digital Systems and Applications**
Unique Paper Code : **32221303**

Max Marks: 75

Duration: 3 Hours

*All questions carry equal marks
Attempt **four** questions in all*

1)

a) Draw a neat and labeled block diagram of a cathode ray oscilloscope (CRO). Explain how a CRO is used to estimate the frequency, time period, phase and voltage of a sinusoidal waveform.

(10.75)

b) Find X for the following numbers:

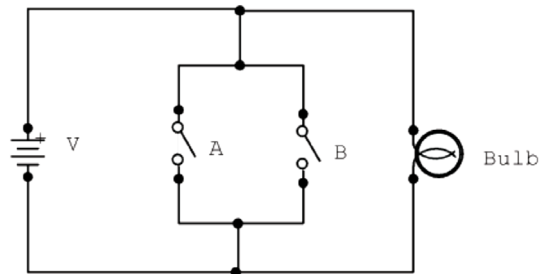
i. $(AEF7.2E)_{16} = (X)_8$

ii. $(25.75)_8 = (X)_{BCD}$

(4)

c) In an electrical circuit shown below, the switches (A, B) may be ON(1) or OFF (0) and will cause the bulb ON(1) or OFF (0):

(4)



- Determine all the possible conditions of the switches for the bulb to be ON(1) and OFF(0) and tabulate it in the form of a truth table.
- Name the logic operation performed by the circuit.
- Draw the logic symbol of the circuit.

2)

a) Simplify the following expressions using Boolean Algebra:

i. $(A\bar{B} + A\bar{C})(BC + B\bar{C})(AB)$

ii. $\overline{\overline{A\bar{B} + ABC} + A(B + A\bar{B})}$ (6)

b) Minimize the following Boolean expression using K-map method: (6.75)

$$F(A, B, C, D) = \sum m(1,3,7, 8, 9,11,13,15) + d(0,2,10,14)$$

c) Implement the following expression using 8x1 multiplexer: (6)

$$F(A, B, C) = \bar{A}C + \bar{B}C + AB\bar{C}$$

3)

a) Write the sign magnitude form and 2's complement form for the following decimal numbers: (4)

i. +10

ii. -14

b) Draw and explain the circuit diagram to find the 1's complement and 2's complement of a 4-bit number. (6)

c) Draw a circuit diagram of clocked JK flip-flop using NAND gates only. Explain its working and give its truth table. Explain the race around condition and its consequences? (8.75)

4)

a) Draw a pin-out diagram of a 555 timer IC. Give any two applications of 555 timer IC. (4)

b) The content of a 4-bit SISO shift register is initially 1011. The data is shifted 7 times, one bit at a time, to right with the serial input being 1→0→1→0→1→1→0. Write the contents of the shift register after each shift. (7)

c) Draw the circuit diagram of a MOD-5 synchronous UP counter using JK flip-flop. (7.75)

5)

a) What do you mean by volatile and non-volatile memories? List the various types of volatile and non-volatile memories. (4)

b) Draw the memory interfacing circuit diagram of 8085 microprocessor based system consisting of one ROM chip of 8 KB and two RAM's of 4KB each. Write the address ranges for each chip. (8.75)

- c) Write an assembly language program to subtract 2CH from C2H which are stored in memory locations 2000H and 2001H respectively using direct addressing mode. Store the result in the memory location 2002H and borrow in 2003H. What will be the contents of memory locations 2002H and 2003H after the execution of program? (6)

6)

- a) Draw and explain the logic circuit for the generation of control signals of microprocessor 8085. (6)

- b) What happens to the microprocessor 8085 when $\overline{RESET\ IN}$ pin is asserted low? (2.75)

- c) Draw and explain the timing diagram of the following instruction:

2000H	LDA 2050H	3AH
2001H		50H
2002H		20H

Determine the time required for the execution of the instruction if the clock frequency is 3 MHz. (10)