W/D/TY

VIT
Vellore Institute of Technology

Final Assessment Test – April 2025

Course: BITE202L – Digital Logic and Microprocessors

Slot: B1+TB1

Class NBR(s): 2958 / 2963 / 2971 / 2973

Max. Marks: 100

Time: Three Hours

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

Answer ALL Questions

(10 X 10 = 100 Marks)

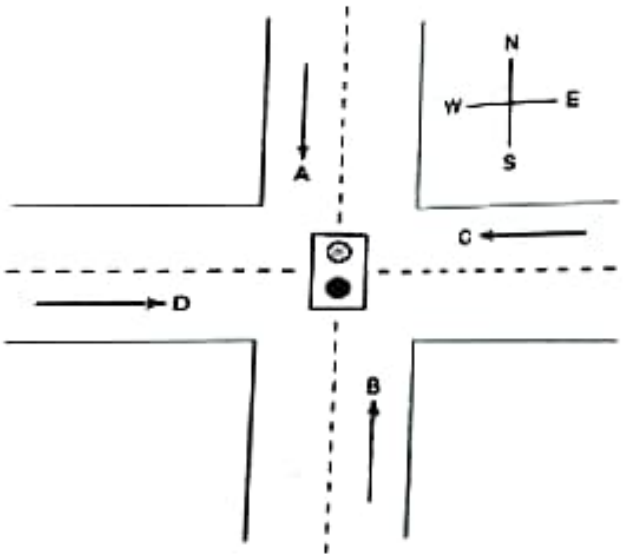
1. a) Convert $(1101.0110)_2$ to decimal and octal. [4]

   b) Convert $(98.625)_{10}$ to binary and hexadecimal. [4]

   c) Convert $(2E.C)_{16}$ to octal. [2]

2. Reduce the following 5 variable Boolean function in SOP form using the five variable K map. $F(A, B, C, D, E) = \sum m(0, 1, 2, 4, 7, 8, 12, 14, 15, 16, 17, 18, 20, 24, 28, 30, 31)$.

3.a) Figure shows the intersection of a main highway with a secondary access road. Vehicle-detection sensors are placed along lanes C and D (main road) and lanes A and B (access road).




These sensor outputs are LOW (0) when no vehicle is present and HIGH (1) when a vehicle is present. The intersection traffic light is to be controlled according to the following logic:

a) The east-west (E-W) traffic light will be green whenever both lanes C and D are occupied.

b) The E-W light will be green whenever either C or D is occupied but lanes A and B are not both occupied.

c) The north-south (N-S) light will be green whenever both lanes A and B are occupied but C and D are not both occupied.

d) The N-S light will also be green when either A or B is occupied while C and D are both vacant.

e) The E-W light will be green when no vehicles are present.

Using the sensor outputs A, B, C, and D as inputs, design a logic circuit to control the traffic light. There should be two outputs, N-S and E-W, that go HIGH when the corresponding light is to be green. Simplify the circuit as much as possible.

**OR**

3.b) Four large tanks at a chemical plant contain different liquids being heated. Liquid-level sensors are being used to detect whenever the level in tank A or tank B rises above a predetermined level. Temperature sensors in tanks C and D detect when the temperature in either of these tanks drops below a prescribed temperature limit. Assume that the liquid-level sensor outputs A and B are LOW when the level is satisfactory and HIGH when the level is too high. Also, the temperature-sensor outputs C and D are LOW when the temperature is satisfactory and HIGH when the temperature is too low. Design a 4x1 MUX logic circuit that will detect whenever the level in tank A or tank B is too high at the same time that the temperature in either tank C or tank D is too low.

4. A PN flip-flop has four operations: clear to 0, no change, complement and set to 1, when inputs P and N are 00, 01, 10 and 11, respectively.

a) Tabulate the characteristic table.

b) Derive the characteristic equation.

c) Tabulate the excitation table.

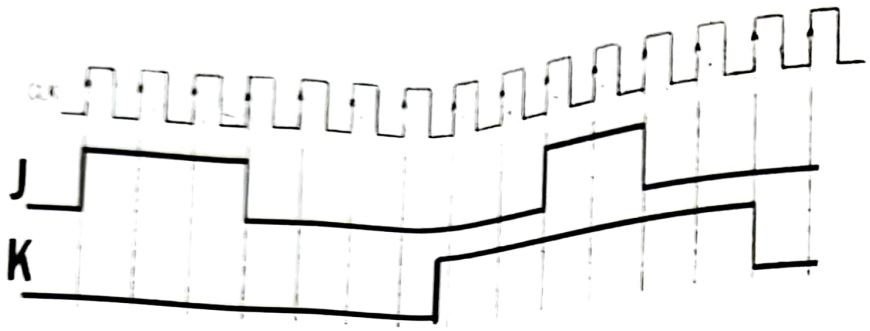
d) Show how the PN flip-flop can be converted to a D flip-flop.

5. Design the sequential circuit specified by the following state table using two different Flip Flop (Note for A use D flip flop and B use T Flip-flop).

| Present state | | Next state | | Output | |
|---|---|---|---|---|---|
| | | X= 0 | X= 1 | X= 0 | X= 1 |
| A | B | AB | AB | Y | Y |
| 0 | 0 | 00 | 10 | 0 | 1 |
| 0 | 1 | 11 | 00 | 0 | 0 |
| 1 | 0 | 10 | 01 | 1 | 0 |
| 1 | 1 | 00 | 10 | 1 | 0 |

[6]

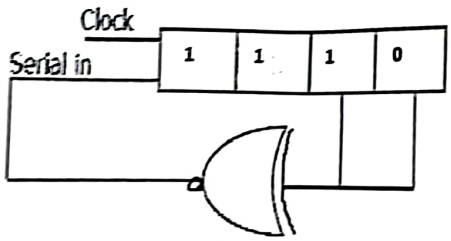
6. a)



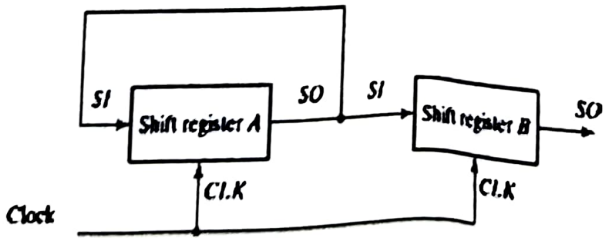

i. Draw the output wave of the flip flop (Q and Q') by considering the flipflop as positive edge triggering and Q=1 initially.

ii. Draw the output wave of the flip flop (Q and Q') by considering the flipflop as negative edge triggering and Q=0 initially.

b) The initial contents of the 4-bit ring counter are 1110. List the contents of the shift registers till it reaches 0000. Also specify the number of clock pulses needed to get 0000. Draw the waveform for five clock pulses. [4]




7.a) Assume the shift registers shown in the below figure, have four bits each. Assume that the binary content of A before the shift is 1101 and that of B is 1011. List the content of the shift registers A and B to show the output for 6 clock pulses. Also draw the timing diagram for the same.




OR

7.b) Design a synchronous counter with the following repeated binary sequence 0, 4, 2, 1, 6. Use T flipflop.

8. With neat sketch describe about 8086 microprocessor architecture including its functional units, data flow and operational features.

9. a) Write an ALP program to transfer a block of ten 16-bit data from one memory location to another. The source data starts at memory location 2000H in the data segment, while the destination starts at memory location 3000H in the data segment. [5]

   b) Write an 8086 Assembly Language Program to calculate the factorial of a given number n. [5]

10. Describe about the Intel 8255 Programmable Peripheral Interface (PPI), including its architecture, functionality, and modes of operation. Include a detailed block diagram to illustrate its working and describe how it interfaces with a microprocessor for peripheral communication.

⇔⇔⇔ W/D/TY ⇔⇔⇔