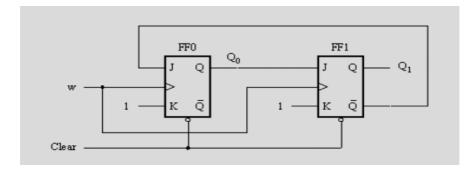Course   :   **ITE205** - **Digital Electronics and Microprocessors**   **Slot: G1+TG1**

Class NBR :   4041/ 4061

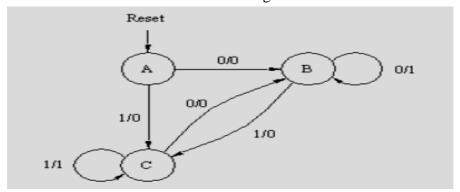**Time   :   Three Hours**   **Max.Marks:100**

PART – A (8 X 5 = 40 Marks)
Answer ALL the Questions

1.   Design a circuit that can be used to control a vending machine. The circuit has five inputs: Q (quarter), D (dime), N (nickel), *Coin*, and *Resetn*. When a coin is deposited in the machine, a coin-sensing mechanism generates a pulse on the appropriate input (Q, D, or N). To signify the occurrence of the event, the mechanism also generates a pulse on the line *Coin*. The circuit is reset by using the *Resetn* signal (active low). When at least 30 cents has been deposited, the circuit activates its output, Z. No change is given if the amount exceeds 30 cents. Design the required circuit by using the following components: a six-bit adder, a six-bit register, and any number of AND, OR, and NOT gates.

2.   Determine the functional behavior of the circuit shown below. Assume that input *w* is driven by a square wave signal.

3.   In digital systems it is often necessary to have circuits that can shift the bits of a vector by one or more bit positions to the left or right. Design a circuit using Multiplexers that can shift a four-bit vector W = w3w2w1w0 one bit position to the right when a control signal Shift is equal to 1. Let the outputs of the circuit be a four-bit vector Y = y3y2y1y0 and a signal k, such that if Shift = 1 then y3 = 0, y2 = w3, y1 = w2, y0 = w1, and k = w0. If Shift = 0 then Y = W and k = 0.

4. Write the State Table and the State Assigned Table for the FSM shown below.

5. Write an ALP to find the square root of given number.

6. Write an ALP to find the factorial of given number.

7. Differentiate between CALL and INTR.

8. Draw the block diagram for Successive approximation **A/D** converter.

PART – B (6 X 10 = 60 Marks)
Answer any <u>SIX</u> Questions

9. From the Table given below, draw the K-Map with Don't Cares and use Don't Cares to simplify the function and implement the simplified function. A,B,C,D are the Inputs.

A	B	C	D	Y
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	1
1	0	1	0	×
1	0	1	1	×
1	1	0	0	×
1	1	0	1	×
1	1	1	0	×
1	1	1	1	×

10. Draw the K-MAP for the Truth Table shown below where A, B, C, D are the inputs. Obtain the SOP equation and draw the Nand-Nand Circuit for the output Y and also draw the complemented output using Nand-Nand Circuit and obtain the POS using NOR – NOR Circuit.

A	B	C	D	Y
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	1
1	0	1	1	1
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

11. Design a sequential circuit using J-K Flip Flop for the table given below.

Present state $y_2 y_1 y_0$	Next state		Count $z_2 z_1 z_0$
	$w = 0$ $Y_2 Y_1 Y_0$	$w = 1$ $Y_2 Y_1 Y_0$	
A 000	000	001	000
B 001	001	010	001
C 010	010	011	010
D 011	011	100	011
E 100	100	101	100
F 101	101	110	101
G 110	110	111	110
H 111	111	000	111

12. Design a Synchronous Mod-6 counter using T-Flip Flop.

13. Explain R – 2R ladder type network.

14. Explain the difficulty with sharing interrupt lines, performance issues and uses of interrupts.

15. Draw the block diagram for 8254 Timer and explain the features and Timer associated with it.

16. Draw the block diagram for 8259 and explain the PIN OUT.

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