

CS/B.Tech/Even/4th Sem/ECE/EC-402/2014

- iii) High level with low temperature and high pressure.  
Design the system, implement using only NOR gates.

b) Simplify using k-map in SOP form:

$$F = \sum m(1,3,4,5,9,11,14,15) + \sum d(2,6,7,8)$$

(10+5)

10. For Synchronous counter with sequence 2→6→5→3→1→0→2

- Give present state/next state table.
- Write state transition table using D flip-flops.
- Simplify and realize the circuit. Draw the state diagram.
- Justify whether the design counter will go in lockout condition or not.
- What should be the corrective design process to avoid the lockout condition?

(2+3+6+2+2)

11. What is the difference between synchronous counter and asynchronous counter? Realize a 4-bit Ring counter using JK flip flops. Develop the state table. Can this circuit be used to realize a frequency divider?

(5+8+2)

12. a) Define the resolution of a DAC. A 6-bit DAC has a step size of 50 mV. Determine the full scale output voltage and resolution.

b) Describe the working principle of 4-bit R-2R ladder circuit.

c) For a R-2R ladder 4-bit DAC converter with  $R=10K\Omega$  and  $V_R=10V$ , find out the feedback resistance  $R_f$  of the OP-AMP for

- First LSB input at the output will be 0.1 V.
- Analog output of 6 V for a binary input of 1000.
- Full scale output voltage of 12 V.
- The actual maximum output Voltage of 10 V.

(2+3)+5+5

13. Write short notes on any three of the following:

(3x5=15)

- Venn diagram
- A 3-bit magnitude comparator
- Glitch and Spike
- Successive approximation ADC
- Draw the NAND, NOR, NOT gates using CMOS

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2014

## Digital Electronic & Integrated Circuits

Time Alloted : 3 Hours

Full Marks : 70

The figure in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable

### GROUP - A

( Multiple Choice Type Questions )

1. Choose the correct alternatives for any ten of the following  
10x1=10

- Gray code of  $(110101)_2$  is  
a) 101111    b) 100110    c) 111010    d) 101011
- If  $(211)_x = (152)_y$ , then the value of base  $x$  is  
a) 6    b) 5    c) 7    d) 9
- Minimum number of 2-input NOR gates are required to design a 2-input NAND gate is  
a) 1    b) 2    c) 3    d) 4
- Which of the following expressions is in the sum-of-products (SOP) form?  
a)  $(A+B)(C+D)$     b)  $(A) B (CD)$   
c)  $AB (CD)$     d)  $AB + CD$
- In fig.- 1 the input condition, needed to produce  $X = 1$ , is

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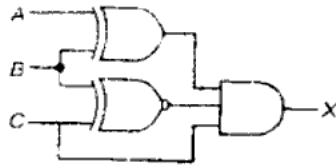


Fig.-1

- a) A = 1, B = 1, C = 0      b) A = 1, B = 1, C = 1  
c) A = 0, B = 1, C = 1      d) A = 1, B = 0, C = 0

- vi) The minimization of logic expression is done in order to  
a) reduces pace      b) reduce cost  
c) reduce number of gates      d) all
- vii) The number of 2 line to 4 line decoders are used to design a 4 line to 16 line decoder is  
a) 2      b) 4      c) 5      d) 6
- viii) The final carry output equation of carry-look-ahead addition is  
a)  $C_{n+1} = P_n C_n + G_n$       b)  $C_{n+1} = P_n + C_n G_n$   
c)  $C_n = P_n + C_n G_n$       d)  $C_n = P_n C_n + G_n$
- ix) Multichannel signals can be transmitted through a single channel by using  
a) demultiplexer      b) encoder  
c) decoder      d) multiplexer
- x) The initial output of S-R Flipflop Q is 0. It changes to 1, when clock pulse is applied. The input S and R will be-  
a) S=1, R=1      b) S=0, R=0      c) S=0, R=1      d) S=1, R=0
- xi) A Mod -2 counter, followed by a Mod -5 counter is  
a) Decade counter      b) Mod-9 counter  
c) Mod-11 counter      d) Mod-7 counter
- xii) The Moore machine is defined by the following equations:  
a) Next state = F (Present state, Inputs) and Outputs = G (Present State)  
b) Next state=F(Inputs) and Outputs=G(Present State)

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- c) Next state=F(Present state) and Outputs=G(Present State)  
d) Next state=F(Present state) and Outputs=G(Inputs)

## GROUP - B

( Short Answer Type Questions )

Answer any three of the following      3x5=15

- Convert J-K f/f to S-R f/f. (5)  
Design a 16:1 multiplexer using 4:1 multiplexers only. (5)  
Write down the excitation table of SR and T flip-flop and derive the characteristic equation for these two flip-flops. (2 + 3)  
Design a bi-directional shift registers and explains its operation. (5)  
Implement the BCD to Excess-3 code conversion using ROM. (5)  
Design a full subtractor using two half-subtractors and OR gate. (5)

## GROUP - C

( Long Answer Type Questions )

Answer any three of the following.      3x5=15

- a) What is the main difference between a latch and a flip-flop?  
b) What is the race around condition? How can we overcome the race around condition?  
c) Design Mod-6 Synchronous counter using JK flip-flops and other gates.      3 + (2 + 3) + 7
1. a) Consider a chemical mixing tank for which there are 3 variables of interest: liquid level, pressure and temperature. The alarm will be triggered under the following conditions:  
i) Low level with high pressure  
ii) High level with low pressure