Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (ECE-OLD)/SEM-4/EC-402/2012

2012

DIGITAL ELECTRONICS CIRCUITS

Time Allotted : 3 Hours *Full Marks* : 70

The figures 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 : $10 \times 1 = 10$

i) Decimal number + 52 and – 52 are

a) 0110100 & 1110100 b) 0101011 & 1101011

c) 0110100 & 1101011 d) none of these.

ii) Addition of two hexadecimal numbers 58 and 24 is

a) 7E b) 7C

c) 6B d) F1.

iii) 2's complement of hexadecimal number 73A is

a) 9C5 b) 8C6

c) 8B7 d) 8F1.

iv) Normally in HA circuit which gate is used for sum part ?

a) XOR b) NAND

c) OR d) AND.

v) Which one is the invalid code in Excess-3 code ?

a) 0001 & 0000 b) 0110 & 0100

c) 1010 & 1100 d) None of these.

vi) If a 3-input NOR gate has eight input possibilities, how many of those possibilities will result in a high output ?

a) 1 b) 2

c) 7 d) 8.

vii) Which one of the following is reflected code ?

a) 8421 b) Gray

c) Excess-3 d) ASCII.

viii) If $(212)_x = (23)_{10}$ then what is the value of x ?

a) 2 b) 3

c) 4 d) 5.

ix) Which of the following codes is used in *K*-map for representing the minterm ?

a) BCD b) Gray

c) 8421 d) Excess-3.

x) The example of a Moore machine is

a) Sequence detector b) Binary counter

c) BCD counter d) UP/DOWN counter.

xi) A 10 MHz signal is applied to a MOD-5 counter followed by a MOD-8 counter. The output frequency will be

a) 10 kHz b) 2·5 kHz

c) 5 kHz d) 25 kHz.

xii) A number of address lines in EPROM 4096 × 8 is

a) 2 b) 4

c) 8 d) 12.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Design a 2 bit comparator using logic gates.
3. Design a BCD adder circuit to add two BCD numbers maximum. The output of the adder should also be in BCD.
4. Minimize the following expressions using *K* map :

   $F(A, B, C, D) = \pi M(0, 7, 8, 9, 10, 11, 15) + \phi(1, 4)$
5. Implement the function using only one 8 : 1 max. Connect BCD with selection line.

   $F(A, B, C, D) = \sum m(0, 1, 2, 5, 9, 11, 13, 15)$
6. What is 'race around problem' ? How can it be overcome in JK flip-flop ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Simplify the following functions by means of *K*-map :
   i) $F = \sum_m (0, 2, 6, 10, 11, 12, 13) + \sum_d (3, 5, 14)$.
   ii) $F = \prod_M (0, 2, 6, 10, 11, 12, 13) . \sum_d (6, 8, 10, 14)$.

   b) Design a common adder-subtractor and explain its function. 5 + 5 + 5
8. a) Write down the present state-next state table of JK & D flip-flops and derive the characteristic equation for these two flip-flops.

   b) Draw logic diagram of the master-slave flip-flop. Why is it called so ?

   c) What are the differences between edge triggered and level triggered flip-flop. (3 + 3) + 5 + 4

9. a) Describe the operation of successive approximation type ADC. How many clock pulses are required in worst case for each conversion cycle of an 8-bit SAR type ADC ?

   b) Draw a neat diagram for an R-2R ladder type DAC and explain its operation. 7 + 8

10. a) Draw the circuit for a 4-bit Johnson counter using *D* flip-flop and explain its operation. Draw its timing diagram. How does its timing diagram differ from that of Ring counter ?

    b) Design a MOD-6 synchronous up-counter using JK flip-flop. 8 + 7

11. Write short notes on any *three* of the following : 3 × 5

    a) EEPROM

    b) CMOS logic

    c) PLD

    d) Even parity generator & checker

    e) Comparator.