Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/BCA/SEM-1/BCA-101/2011-12

2011

DIGITAL ELECTRONICS

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) ($A + A' B + B'$) is equal to

a) A b) B'

c) 1 d) 0.

ii) (10110) is equivalent to

a) 20 b) 22

c) 24 d) 18.

iii) A BCD counter is an example of

a) a decade counter

b) a full modules counter

c) both (a) and (b)

d) none of these.

iv) The output of a gate is LOW if and only if all its inputs are HIGH. It is true for

a) AND b) XNOR

c) NOR d) NAND.

v) De-Morgan's law states that

a) $(A + B)^{\prime} = A^{\prime} \cdot B^{\prime}$ b) $(A + B)^{\prime} = A^{\prime} + B^{\prime}$

c) $(A \cdot B)^{\prime} = A^{\prime} \cdot B^{\prime}$ d) both (a) and (c).

vi) The complement of a variable is always

a) 0

b) 1

c) equal to the variable

d) the inverse of the variable.

vii) 2's complement of '101011' is

a) 010100 b) 010011

c) 101001 d) 010101.

viii) What is the ASCII code of 'A' ?

a) 98 b) 0100

c) 1100 d) none of these.

ix) 4-bit register can store

a) a bit at a time b) a byte at a time

c) a nibble at a time d) none of these.

x) In toggle state of JK Flip-Flop

a) present output is opposite of previous output

b) present output is same as previous output

c) both (a) and (b)

d) none of these.

xi) Full adder can add

a) two binary numbers b) three binary numbers

c) four binary numbers d) none of these.

xii) MOD - 10 counter can count up to

a) 9 b) 10

c) 8 d) none of these.

GROUP – B

(Short Answer Type Questions)

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

2. State and prove De-Morgan's theorems.
3. Express the Boolean function F = AB + $\bar{A}$ C in a product of maxterm form.
4. Define multiplexer. Why is it called "Data Selector" ? 3 + 2
5. Use 4 : 1 MUX and other necessary logic gates to design a full adder.
6. What is flip-flop ? What is meant by race condition ? 1 + 4

GROUP – C

(Long Answer Type Questions)

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

7. a) Using K-map method, simplify the following Boolean function and obtain minimal SOP expression :

$Y = \sum m$ (0, 2, 3, 6, 7) + $\sum$d (8, 10, 11, 15).

b) Implement the Boolean Function F = (A, B, C, D) = $\sum m$ (0, 1, 3, 8, 9, 15) using two 4 - to-1 multiplexer and one OR gate.

c) Design a gray code to binary converter circuit of 5 bits. What is nibble ? 5 + 5 + (4 + 1)

8. a) Design a half adder circuit using minimum number of 2-input NOR gates only. Write Down the truth table and Boolean functions also.

   b) Convert a *D* flip-flop to a J-K flip-flop. You can use additional circuiting if required.

   c) What is full subtractor ? Explain its basic structure with proper logic diagrams and truth tables. 5 + 5 + 5

9. a) Convert the following :
   i) $(AC15)_{16} = (?)_{10}$
   ii) $(1011001)_2 = (?)_{10}$

   b) Discuss about the design of an odd parity generator.

   c) Explain the concept of parity checking.

   d) What is the advantage of J-K flip-flop over SR flip-flop. 5 + 5 + 2 + 3

10. a) What is the difference between sequential and combinational circuit ?

    b) Describe the propagation delay of a flip-flop.

    c) Express the Boolean function
    $F = AB + A'C$ in a product of maxterm form. 5 + 5 + 5

11. a) Draw a block diagram and write truth table of a *D* flip-flop.

    b) Compare asynchronous and synchronous counter.

    c) Use 4 to 1 MUX and other necessary logic gate to design a full adder. 5 + 5 + 5

12. Write short notes on any *three* of the following : 3 × 5
    a) EPROM
    b) *D* flip-flop
    c) Ripple counter
    d) Encoder
    e) 4-bit parallel Adder.