Duration: 2 Hours   Max Marks: 60

Instructions: 1) Figures to the right indicate Full Marks.
2) All Questions are compulsory.
3) Use of non programmeable calculator is allowed.

Q.1A.State whether the following statements are true or false.   (5x1= 05 marks)

a) The decimal number system has base 2.
b) The negation of ' this paper is white' is given as ' this paper is black.'
c) In Boolean Algebra the dual of a + 0 is given as a * 1 .
d) Let A={1,2,3} B = {2,3,4}.then n (AUB) = 4.
e) Let A and B be two sets such that A = B . Then A x B = B x A.

Q.1B. Answer the following questions.   (5x1= 05 marks)

a) Check if the following are statements or not. Justify your answer.
   i)What is your name?.
   ii) $10 \leq 8$.
b) Let A = {5,6,7} , B ={1,2,3} and
   R = { (5,1) ,(6,3) ,(7, 2)} Check if R is one one and onto function.
c) Find the total number of ways in which 4 people can be arranged in one line .
d) Write the elements of the set $A = \{x \ / \ x \in \mathbb{Z}, \ -5 < x < 2\}$.
e) Find the value of 'n' if $C(n , 1) + 3! = 20$.

Q.2. Answer the following.   10 marks
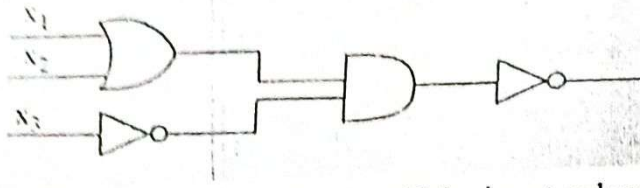
a) Convert the Decimal number 200 to it's Octal form.   (2)
b) Write the negation of   i) Today is Monday.
   Write the contrapositive of i) "If today is Sunday, then it is a holiday."   (3)
c) Prove by the Principle of Mathematical Induction
   p(n): $4 + 8 + 12 + \ ... + 4n = 2n(n + 1)$ (5)

Q.3. Answer the following   10 marks

a) Use table and find the values of $f(x, y, z) = \overline{x.y} + z$.   (2)
b) Convert the Hexadecimal number 4A3F to it's Decimal form.   (3)

c) Find $f(x_1, x_2, x_3)$ in the given circuit.

Also find the value of output if the input values are as follows: (5)

$x_1 = 0$, $x_2 = 1$, $x_3 = 1$

10 marks

Q.4. Answer the following.

a) Define Universal set.
   Let X be a universal set and A be subset of X. let $n(x) = 100$ and (2)
   $n(A) = 80$ then find $n(A^c)$.

b) Construct the truth table for the logical statement $p \wedge (\sim (p \vee q))$ (3)
   and check if it is a Tautology.

c) Let $X = \{1,2,3,4,5,6\}$ $A = \{2,4,6\}$ $B = \{1,2,3,4\}$ Verify the two De Morgan's Laws (5)
   for the sets A and B .

10 marks

Q.5. Answer the following.

a) $F(x) = 3$ for $-3 \le x \le -1$
      $= -6x - 3$ for $-1 \le x \le 0$
      $= 3x - 3$ for $0 < x \le 1$ (2)
   Evaluate $F(-2)$ and $F(0)$

b) Let $A = \{2,4,6\}$ and $R = \{(x, y)/x \ge y, x \in A, y \in A\}$. (3)
   Check if R is reflexive, symmetric and Transitive.

c) Let $f(x) = x + 2$ and $g(x) = 2x^2$ (5)
   Then find i) f(g(x))   ii) f(f(x))   iii) (f + g)(4)

10 marks

Q.6. Answer the following.

a) Find the number of different arrangements of letters of the word MOODLE. (2)

b) Convert the following compound statement in symbolic form into simple
   verbal statements. Let p:Lisa is a student
        q: She is an intelligent girl
        r: She can play Chess
   (3)
   i) $p \wedge q \wedge r$ ii) $\sim p \wedge q$

c) In how many ways can a man invite 7 of his friends for a party so that 3 or more (5)
   than 3 of his friends will remain present ?