ISC SEMESTER 1 EXAMINATION
SPECIMEN QUESTION PAPER
COMPUTER SCIENCE
PAPER 1
(THEORY)

Maximum Marks: 70

Time allowed: One and a half hours

(*Candidates are allowed additional **15 minutes** for **only** reading the paper.*)

ALL QUESTIONS ARE COMPULSORY

The marks intended for questions are given in brackets [ ].

Select the correct option for each of the following questions.

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1 The law which represents the Boolean equation $A + B = B + A$ is: [1]

   (a)   Associative Law

   (b)   Distributive Law

   (c)   Commutative Law

   (d)   Absorption Law

2 The dual of the Boolean equation $(X+Y) \cdot 1 = X+Y$ is: [1]

   (a) $X+Y + 0$

   (b) $X \cdot Y + 0 = X \cdot Y$

   (c) $(X \cdot Y) + 1 = X \cdot Y$

   (d) $(X+Y) + 0 = X \cdot Y$

3 If A=1, B=0, C=0 and D=1, then the maxterm will be: [1]

   (a) $AB'C'D$

   (b) $A'BCD'$

   (c) $A+B'+C'+D$

   (d) $A'+B+C+D'$

4   The compliment of the Boolean expression F(P,Q,R) = (P + Q + R) is: [1]

   (a)   P'Q'R'

   (b)   P' + Q' + R'

   (c)   P + (Q'+R')

   (d)   (P+Q) + R'

5   The propositional operator => represents: [1]

   (a)   Conjunction

   (b)   Implication

   (c)   Disjunction

   (d)   Negation

6   Encoders are used for: [1]

   (a)   Adding two bits

   (b)   Converting Decimal to Binary

   (c)   Converting Binary to Decimal

   (d)   Data transmission

7   NAND gate is formed by the combinations of: [1]

   (a)   AND gate and OR gate

   (b)   OR gate and NOT gate

   (c)   NAND gate and NOT gate

   (d)   AND gate and NOT gate

8   The combinational circuit which adds two binary bits is: [1]

   (a)   Full Adder

   (b)   Decoder

   (c)   Half Adder

   (d)   Multiplexer

9 The Quad group in a Karnaugh's map eliminates: [1]

   (a) One variable

   (b) Four variables

   (c) Three Variables

   (d) Two variables

10 The proposition (a <=> b) is represented by: [1]

   (a) a'b' + ab

   (b) (a'+b') · (a+b)

   (c) (a+b)'

   (d) (a·b)'

11 If the input in a decoder is A'BC'D, then the decimal equivalent output will be: [2]

   (a) 8

   (b) 10

   (c) 5

   (d) 6

12 A matrix MAT[10][15] is stored in the memory in Row Major Wise with each element requiring 2 bytes of storage. If the base address at MAT[1][2] is 2215, then the address of MAT[3][7] will be: [2]

   (a) 2285

   (b) 2315

   (c) 2319

   (d) None of the above

13 With reference to the given proposition **~P => Q** , answer the following questions:

   (a) the converse of the proposition is: [1]

       (i) ~Q => P

       (ii) Q => ~P

       (iii) ~Q => ~P

       (iv) ~P => ~Q

(b)   the contra-positive of the proposition is: [1]

    (i)   ~P => Q

    (ii)   Q => P

    (iii)   ~Q => P

    (iv)   ~ P => ~Q

14   The reduced expression for the Boolean expression $F(X,Y,Z) = \sum(0,1,2,3,4,5,6,7)$ is: [2]

(a)   XY' + X'Y

(b)   1

(c)   0

(d)   None of the above

15   What is the output of the code given below?
```
int i,j;
for( i=1; i<=5;i++);
 for(j=i+1;j<1;j++);
   System.out.print(i + "+" + j) ;
```
[2]

(a)   67

(b)   1+2

(c)   6+7

(d)   12

16   What is the output of the statement given below?
```
System.out.print(Integer.parseInt("234")+'A');
```
[2]

(a)   234+65

(b)   234A

(c)   299

(d)   ERROR

17 What is the output of the statement given below?
    System.out.print('A'+'1'+'C');   [2]

    (a)   65+1+66

    (b)   10+1+67

    (c)   181

    (d)   65+49+67

18 The basic logic gate that represents the simplification of the Boolean expression
    A.(A'+B). (A+B) is: [2]

    (a)   OR gate

    (b)   NOT gate

    (c)   AND gate

    (d)   None of the above

19 What is the conditional statement to check for the Non-boundary elements in a double
    dimensional array of 'M' number of rows and 'N' number of columns? The row index   [2]
    is represented by 'r' and the column index is represented by 'c'.

    (a)   (r>0 || r<M-1 && c>0 || c<N-1)

    (b)   (r>0 && r<M-1 || c>0 && c<N-1)

    (c)   (r>0 && r<M-1 && c>0 && c<N-1)

    (d)   (r>0 || r<M-1 || c>0 || c<N-1)

20 The proposition ~(a ∧ b) V (~a => b) is a: [2]

    (a)   Contradiction

    (b)   Contingency

    (c)   Tautology

    (d)   Implication

21 Reduce the given Boolean function F(A,B,C,D) = $\sum$(0,2,4,8,9,10,12,13) by using 4-variable Karnaugh map and answer the following questions:

(a) What will be the least number of groups and their types formed for reduction? [1]

   (i)   6 pairs

   (ii) 2 quad and 2 pairs

   (iii) 1 quad and 3 pairs

   (iv) 3 quads

(b) The reduced expression of the Boolean function given above is: [2]

   (i)   ACD' + B'D' + BD

   (ii) (A+C'+D').(B'+D').(A+C')

   (iii) C'D' + AC' + B'D'

   (iv) (C+D'). (B'+D').(A+B+D)

22 A school intends to select candidates for an Inter school competition as per the criteria given below:
   • The student has participated in an earlier competition and is very creative
                          Or
   • The student is very creative and has excellent general awareness, but has not participated in any competition earlier
                          Or
   • The student has excellent general awareness and has won prize in an inter -house competition

   The inputs are:

Inputs	
A	Participated in a competition earlier
B	Is very creative
C	Won prize in an inter house competition
D	Has excellent general awareness

   (In all the above cases 1 indicates yes and 0 indicates no).

   Output: X [1 indicates yes and 0 indicates no for all cases].

   Draw the truth table for the inputs and outputs given above and answer the following questions:

(a)   The POS expression for X(A,B,C,D) will be: [2]

    (i) $F(A,B,C,D) = \sum (3, 5, 7, 11, 12, 13, 14, 15)$

    (ii) $F(A,B,C,D) = \pi (3, 5, 7, 11, 12, 13, 14, 15)$

    (iii) $F(A,B,C,D) = \pi (0, 1, 2, 4, 6, 8, 9, 10)$

    (iv) $F(A,B,C,D) = \sum (0, 1, 2, 4, 6, 8, 9, 10)$

(b)   The maximum input combinations for the above truth table will be: [1]

    (i)   24

    (ii)   16

    (iii)   8

    (iv)   4

23   Reduce the given Boolean function $F(A,B,C,D) = \pi(3,4,5, 6, 7, 11,13,15)$ by using 4-variable Karnaugh map and answer the following questions:

(a)   What will be the least number of groups and their types formed for reduction?   [1]

    (i)   6 pairs

    (ii)   3 quads

    (iii)   1 quad and 3 pairs

    (iv)   2 quad and 3 pairs

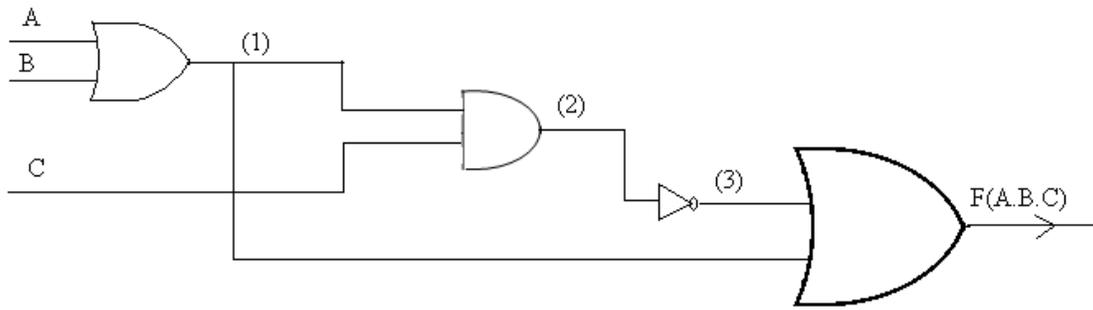(b)   The reduced expression of the Boolean function given above is: [2]

    (i)   (B+C).(B+D).(A'+D)

    (ii)   BC + BD + A'D

    (iii)   AB' + C'D' + B'D'

    (iv)   (A+B').(C'+D').(B'+D')

24

From the logic diagram given above, where A,B and C are inputs and F is the output, answer the following questions:

(a) The expression at (1) is: [1]

    (i) A.B

    (ii) A'+B'

    (iii) A+B'

    (iv) A+B

(b) The expression at (3) is: [1]

    (i) A+B.C'

    (ii) ((A+B)'.C)'

    (iii) ((A+B).C)'

    (iv) (A+B).C

(c) The final expression F(A,B,C) is: [1]

    (i) F=((A+B)'.C)' + (A+B)

    (ii) F= (A+B)'.(C+A+B)

    (iii) F=((A+B).C)' + (A+B)

    (iv) F= (AB + C)' +(A+B)

25 Given the Boolean expression $F = (P + R) \cdot (P{\cdot}Q + Q{\cdot}R')$, identify:

(a) The complement of the expression: [2]

(i) P'R' + (P'+Q').(Q'+R)

(ii) (P'+R') . (P'+Q') + (Q+R')

(iii) P'R' .(PQ' + Q'R)

(iv) (P+R)' .(P'+Q).(Q'+R)

(b) The law used: [1]

(i) Distributive Law

(ii) De Morgan Law

(iii) Associative Law

(iv) Idempotent Law

26 With reference to the program code given below, answer the questions that follow:
void fun(int n)
{ int i,f;
for(i=1,f=1;i<=n;i++,f*=i);
System.out.print(f);
}

(a) What is the output of the method **fun()** when the value of n=4?   [2]

(i) 24

(ii) 72

(iii) 120

(iv) ERROR

(b) What is the method **fun()** performing?   [1]

(i) Checking for Prime Numbers

(ii) Product of odd numbers

(iii) Factors of a number

(iv) Finding the factorial

27   With reference to the program code given below, answer the questions that follow:

```
int test(int n)
   { if(n==1) return 0;
       for (int i=2;i<=(int)(Math.sqrt(n));i++)
      if( n%i==0)
        return 0;
     return 1;
   }
```

(a)   What will the method **test()** return when the value of n=9?   [2]

(i)   1

(ii)   true

(iii)   0

(iv)   Error

(b)   What is the method **test()** performing?   [1]

(i)   Prime number/Composite number

(ii)   Armstrong number

(iii)   Palindrome number

(iv)   Perfect number

28   With reference to the program code given below, answer the questions that follow:

```
void dimen(int n[ ][ ])
{ int p=0;
   for (int i=0;i<n.length;i++)
    for(int j=0;j<n[0].length;j++)
     { if(i==0 ||i==n.length-1 || j==0 || j==n[0].length-1)
         p=p+n[i][j];
     }
   System.out.print(p);
}
```

(a)   What will be the output of the method **dimen()** when the value of
       n[ ][ ] ={{2,3,7},{1,5,9},{10,-3,8}} ?   [2]

(i)   42

(ii)   33

(iii)   5

(iv)   37

(b)　What is the method **dimen( )** performing?　　　　　　　　　　　　　　　[1]

(i)　Finding the product of the boundary elements

(ii)　Finding the sum of the non-boundary elements

(iii)　Finding the sum of the boundary elements

(iv)　Finding the sum of the matrix elements

29　With reference to the program code given below, answer the questions that follow:

```
void single(int x[])
{  int w=1;
   for(int y=0;y<x.length;y++)
    {  if(x[y]%2==0 && x[y]>0)
         w=w*x[y];
    }
   System.out.print(w);
}
```

(a)　What will be the output of the method **single()** when the value of x[] = {10,2,9,-6,5,6} ?　　　　　　　　　　　　　　　[2]

(i)　120

(ii)　45

(iii)　720

(iv)　18

(b)　What is the method **single( )** performing?　　　　　　　　　　　　　　　[1]

(i)　Sum of the positive odd elements

(ii)　Product of the even elements

(iii)　Product of the positive even elements

(iv)　Sum of the positive even elements

30 With reference to the program code given below, answer the questions that follow:

```
int solve(int a, int b)
  {  int i,l=0;
      for(i=1;i<=a*b;i++)
        {  if(i%a==0&& i%b==0)
            { l=i; break;}
        }
      return l;
  }
```

(a)   What will be the output of the method **solve()** when the value of a=8 and b=12?   [2]

    (i)   4

    (ii)   96

    (iii)   0

    (iv)   24

(b)   What is the method **solve( )** performing?   [1]

    (i)   HCF of 'a' and 'b'

    (ii)   Prime Factors of 'a' and 'b'

    (iii) LCM of 'a' and 'b'

    (iv) None of the above

31 The following program code checks if the positive integer 'N' is a palindrome number by returning true or false. There are some places in the code marked as **?1?, ?2?, ?3?, ?4?** and **?5?** which are to be replaced by a statement/expression so that the code works properly.

```
boolean Palindrome(int N)
{ int rev = ?1? ;
  int num = N;
  while (num>0)
  { int f = num/10;
    int s = ?2? ;
    int digit = num − ?3? ;
    rev = ?4? + digit;
    num /= ?5?;
  }
  if(rev == N)
    return true;
  else
    return false;
}
```

Answer the following question:

(a)   What is the statement or expression at ?1?   [1]

       (i)   -1

       (ii)   0

       (iii)   10

       (iv)   2

(b)   What is the statement or expression at ?2?   [1]

       (i)   s *10

       (ii)   f /10

       (iii)   rev

       (iv)   f *10

(c)   What is the statement or expression at ?3?   [1]

       (i)   s

       (ii)   rev

       (iii)   f

       (iv)   digit * 10

(d)   What is the statement or expression at ?4?   [1]

       (i)   s * 10

       (ii)   rev *10

       (iii)   f

       (iv)   rev

(e)   What is the statement or expression at ?5?   [1]

       (i)   1

       (ii)   100

       (iii)   10

       (iv)   rev

32 The following program code sorts a single dimensional array in ascending order using **Insertion Sort technique**. There are some places in the code marked as **?1?, ?2?, ?3?, ?4?** and **?5?** which are to be replaced by a statement/expression so that the code works properly.

```
void insertionSort(int array[])
  {  int n = ?1?;
     for (int j = 1; j < n; j++)
     {
        int key = ?2?;
        int i = j-1;
        while ( (i > -1) && ( array [i] > ?3? ) )
        {
           array [i+1] = ?4?;
           i--;
        }
        ?5? = key;
     }
```

Answer the following question:

(a) What is the statement or expression at ?1?   [1]

   (i)   array.length()

   (ii)   array.length

   (iii) length

   (iv)   -1

(b) What is the statement or expression at ?2?   [1]

   (i)   j

   (ii)   array[j+1]

   (iii) array[j]

   (iv)   0

(c) What is the statement or expression at ?3?   [1]

   (i)   key

   (ii)   array[j]

   (iii) i+1

   (iv)   n

(d)   What is the statement or expression at ?4?   [1]

    (i)   j+1

    (ii)   key

    (iii)   array[j]

    (iv)   array[i]

(e)   What is the statement or expression at ?5?   [1]

    (i)   array[i+1]

    (ii)   i+1

    (iii)   j

    (iv)   array[i]