

ISC SEMESTER 1 (SPECIMEN PAPER SOLVED)  
COMPUTER SCIENCE

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

(Ans) c. Commutative law

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

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

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

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

4. The complement of the Boolean expression  $F(P, Q, R) = (P+Q+R)$  is

(Ans)  $(P+Q+R)' = P' \cdot Q' \cdot R' \cdot a$

5. The propositional operator  $\Rightarrow$  represents:

(Ans) b. Implication

6. Encoders are used for:

(Ans) b. Converting Decimal to Binary

7. NAND gate is formed by the combination of:

(Ans)

d. AND gate and NOT gate

8. The combinational circuit which adds two binary bits is:

(Ans)

c. Half Adder

9. The Quad group in a Karnaugh's map eliminates:

(Ans)

d. Two variables

10. The proposition ( $a \Leftrightarrow b$ ) is represented by:

(Ans)

a.  $a'b' + ab$

11. If the input in a decoder is  $A'B'C'D$ , then the decimal equivalent output will be:

(Ans)

$$\begin{aligned} A'B'C'D &= (0101)_2 \quad \text{Multiplication} \rightarrow \text{Minterm} \\ &= 2^0 * 1 + 2^1 * 0 + 2^2 * 1 + 0 * 1' \rightarrow 0 \\ &= 1 + 4 \quad a \rightarrow 1 \\ &= 5 \quad .c \end{aligned}$$

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 of  $MAT[1][2]$  is 2215, then the address of  $MAT[3][7]$  will be:

(Ans)  $A[I][J] = B + w * ((I - LR) * N + (J - LC))$

$$= 2215 + 2 [ (3-1) * 15 + (7-2) ]$$

$$= 2215 + 2 [ 2 * 15 + 5 ]$$

$$= 2215 + 2 * 35$$

$$= 2285$$

13. With reference to the given proposition  $\sim P \Rightarrow Q$  answer the following questions:

(a) the converse of the proposition is:

(Ans) .ii  $Q \Rightarrow \sim P$

(b) the contrapositive of the proposition is:

$$\sim Q \Rightarrow \sim (\sim P)$$

$$\sim Q \Rightarrow P .iii$$

14. The reduced expression for the Boolean expression  $f(x,y,z) = \Sigma(0,1,2,3,4,5,6,7)$

(Ans) .b 1

|      | $y'z'$ | $y'z$ | $yz$ | $yz'$ |
|------|--------|-------|------|-------|
| $x'$ | 1      | 0     | 1    | 1     |
| $x$  | 1      | 1     | 1    | 0     |

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);

(Ans) .c 6+7

16. What is the output of the statement given below?

System.out.print(Integer.parseInt("234") + A)

ASCII code of A = 65

Ans

$$234 + 65 = 299$$

17. What is the output of the statement given below?

System.out.println('A' + 'I' + 'C');

65 + 49 + 67 ASCII code of

Ans

$$= 181 \cdot c$$

A → 65

I → 49

C → 67

18. The basic logic gate that represents the simplification of the Boolean expression.

A.  $(A' + B) \cdot (A + B)$  is :

$$A \cdot (A' + B) \cdot (A + B)$$

$$= (AA' + AB) \cdot (A + B)$$

$$= (0 + AB) \cdot (A + B)$$

$$= AB(A + B)$$

$$= AB \cdot A + AB \cdot B$$

$$= AB + AB$$

$$= AB$$

. C AND gate

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 is represented by 'i' and the column index is represented by 'j'.

(Ans) ~~For Boundary elements~~

$$i > 0, i < M-1$$

$$j > 0, j < N-1$$

$$\cdot c \quad (i > 0 \& i < M \& j > 0 \& j < N-1)$$

20. The proposition  $\sim(a \wedge b) \vee(\sim a \Rightarrow b)$  is a:

| (Ans) | a | b | $(a \wedge b)$ | $\sim(a \wedge b)$ | $(\sim a \Rightarrow b)$ | $\sim(a \wedge b) \vee(\sim a \Rightarrow b)$ |
|-------|---|---|----------------|--------------------|--------------------------|---|
|       | 0 | 0 | 0              | 1                  | 0                        | 1   |
|       | 0 | 1 | 0              | 1                  | 1                        | 1   |
|       | 1 | 0 | 0              | 1                  | 1                        | 1   |
|       | 1 | 1 | 1              | 0                  | 1                        | 1   |

.c Tautology

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.

Aus

.iv 3 quads

|                  | $\bar{C}D$ | $\bar{C}D'$ | $CD$ | $CD'$ |    |    |  |  |  |  |  |
|------------------|------------|-------------|------|-------|----|----|--|--|--|--|--|
| $\bar{A}\bar{B}$ | 1          | 0           | 1    | 2     |    |    |  |  |  |  |  |
| $\bar{A}B$       | 1          | 0           | 5    | 7     | 6  |    |  |  |  |  |  |
| $AB$             | 1          | 1           | 1    | 3     | 15 | 14 |  |  |  |  |  |
| $A\bar{B}$       | 1          | 1           | 1    | 1     | 11 | 10 |  |  |  |  |  |

$$3 \text{ Quad. } \bar{C}D + A\bar{C} + B'D'$$

- b. The reduced expression of the Boolean function given above is:

Aus .iii  $C'D' + AC' + B'D'$

22. A school intends to select candidates for an Interschool competition as per the criteria given below:

- o The student has participated in an earlier competition and is very creative.

Or  $A \& B$

- o The student is very creative and has excellent general awareness, but has not participated in any competition earlier.

Or  $B \& D \& A'$

- o The student has excellent general awareness and has won prize in an inter-house competition.

D & C

The inputs are:

Inputs

- A Participated in a competition earlier
- B Is very creative
- C Won prize in an interhouse competition
- D Has excellent general awareness.

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

| A | B | C | D | X |    |
|---|---|---|---|---|----|
| 0 | 0 | 0 | 0 | 0 | 0  |
| 0 | 0 | 0 | 1 | 0 | 1  |
| 0 | 0 | 1 | 0 | 0 | 2  |
| 0 | 0 | 1 | 1 | 1 | 3  |
| 0 | 1 | 0 | 0 | 0 | 4  |
| 0 | 1 | 0 | 1 | 1 | 5  |
| 0 | 1 | 1 | 0 | 0 | 6  |
| 0 | 1 | 1 | 1 | 1 | 7  |
| 1 | 0 | 0 | 0 | 0 | 8  |
| 1 | 0 | 0 | 1 | 0 | 9  |
| 1 | 0 | 1 | 0 | 0 | 10 |
| 1 | 0 | 1 | 1 | 1 | 11 |
| 1 | 1 | 0 | 0 | 1 | 12 |
| 1 | 1 | 0 | 1 | 1 | 13 |
| 1 | 1 | 1 | 0 | 1 | 14 |
| 1 | 1 | 1 | 1 | 1 | 15 |

(a) The POS expression of  $X(A, B, C, D)$  will be

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

(b) The maximum input combinations for the above truth table will be.

**Ans** ii Total combinations =  $2^4 = 16$

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?

**Ans** .iii 3 squares

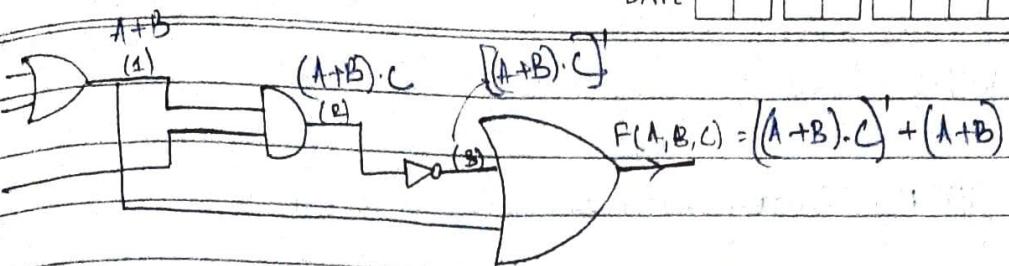
|       | C+D            | C+D'            | C'D             | C'D'            |
|-------|----------------|-----------------|-----------------|-----------------|
| A+B   | 0              | 1               | 0 <sub>3</sub>  | 2               |
| A+B'  | 0 <sub>1</sub> | 0 <sub>5</sub>  | 0 <sub>7</sub>  | 0 <sub>6</sub>  |
| A'+B  | 1 <sub>2</sub> | 0 <sub>13</sub> | 0 <sub>11</sub> | 1 <sub>7</sub>  |
| A'+B' | 1 <sub>5</sub> | 1 <sub>9</sub>  | 0 <sub>11</sub> | 1 <sub>10</sub> |

3 Quads  
 $(A+B')(C+D')(B'+D')$

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

**Ans** .iv  $(A+B')(C+D')(B'+D')$

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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:

(Ans) iv  $A+B$

(b) The expression at 3 is:

(Ans) iii  $((A+B) \cdot C)'$

(c) The final expression  $F(A,B,C)$  is:

(Ans) iii  $F = ((A+B) \cdot C)' + (A+B)$

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

(a) The complement of the expression:

(Ans)  $((P+R) \cdot (P \cdot Q + Q \cdot R'))'$

$$= (P+R)' + (P \cdot Q + Q \cdot R')'$$

$$= P' \cdot R' + (P \cdot Q)' \cdot (Q \cdot R')'$$

$$= P' \cdot R' + (P'+Q') \cdot (Q'+R) \cdot i$$

(b) The law recall:

(Ans) (iii) De Morgans 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.println (f);  
}

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

(Ans) i=1, f=1

i&lt;=4; i=2, f=2

2&lt;=4 i=3, f=6

3&lt;=4 i=4, f=24

4&lt;=4 i=5, f=120

∴ 120

(iii) 120

(b) What is the method fun () performing?

(Ans) iv Find the factorial

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

{ if (n==1) return 0;

for (int i=2; i&lt;=int) (Math.sqrt(n)); i++)

if (n % i == 0)

return 0;

return 1; }

(a) What will the method test() return when the value of  $n=9$ ?

(Ans) iii. 0

$i < 3$

$9/02 == 1 \times$

$9/103 == 0 \checkmark$

→ return 0

(b) What is the method test() performing?

(Ans) (i) Prime number / Composite Number.

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

```
void dmen (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);

System.out.print(p);

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

(Ans)  $2+3+7+9+8+10+1 = 37$  (iv)

|    |    |   |
|----|----|---|
| 2  | 3  | 7 |
| 1  | 5  | 9 |
| 10 | -3 | 8 |

(b) What is the method `single()` performing?

Ans

iii. Finding the sum of the boundary elements

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

`void single (int x[])`

{ int w=1;

for (int y=0; y < x.length; y++)

{ if (x[y] % 2 == 0 && x[y] > 6)

w = w \* x[y]

}

`System.out.println(w);`

}

(a) What will be the output of the method `single()` when the value of `x[] = {10, 29, -6, 5, 7}`

Ans

$$10 \times 2 \times 6 = 120 . i$$

(b) What is the method `single()` performing?

Ans

product of 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 value of a=8 and b=12 ?

(An) .iv 24

(b) What is the method solve () performing ?

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

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.

b20

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 ;  
}
```

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

(Ans) .ii 0 (initialization of rev)

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

(Ans) .iv f \* 10

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

(Ans) .i s

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

(Ans) .ii rev \* 10

(c) What is the statement or expression at ?5?

Ans. .iii 10

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?, ?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
    }
}
```

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

Ans. .ii array.length

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

Ans. .iii array[i]

(c) What is the statement or expression at 93?

Ans. .i key

(d) What is the statement or expression at 94?

Ans. .iv array [i]

(e) What is the statement or expression at 95?

Ans. .i array [i+1]