

# I TERM EXAMINATION: 2021-22

Class - XII

## Subject - COMPUTER SCIENCE PAPER - 1

Time : 3 hrs.

M.M. : 70

Answer ALL questions in Part I ( Compulsory ) and SIX Questions from Part II, Choosing TWO questions from Section A, TWO questions from Section B, TWO questions from Section C.

All working including rough work, should be done on the same sheet as the rest of the answers.

The intended marks for questions or parts are given in [ ].

### PART - 1 [20 Marks]

Answer all questions. While answering questions in this part include briefly your working and reasoning, whenever required.

#### Question 1

- (a) Define and verify Absorption law. [1]
- (b) Find the dual of:  $(A'+B).0.B' = 0$  [1]
- (c) If  $F(A,B,C) = A'(BC' + B'C)$ , Then find  $F'$ . [1]
- (d) Draw the logic diagram of XNOR gate using NAND gates only. [1]
- (e) If  $A = 0$ ,  $B = 1$ ,  $C = 1$  and  $D = 0$  then write *minterm* and *maxterm*. [1]

#### Question 2

- (a) Write any two uses of the 'this' keyword. [2]
- (b) What are Wrapper classes? Give any two examples. [2]
- (c) What is the purpose of StringTokenizer class? Write any two functions name of StringTokenizer class. [2]
- (d) What is the significance of the keyword 'new 'in Java? Mention the areas where it is used. [2]
- (e) A matrix  $B[10][20]$  is stored in the memory with each element requiring 4 bytes of storage. If the base address at  $B[2][1]$  is 2140, find the address of  $B[6][4]$  when matrix is stored in **Row Major Wise**. [2]

#### Question 3

The following is a part of some class that computes and returns the GCD (greatest common divisor) of any two numbers. There are some places in the code marked by ?1?, ?2?, ?3?, ?4?, ?5? which must be replaced by statement or expression so that the function runs correctly. [5]

```
int gcd(int a, int b)
{
    int r;
    while(?1?)
    {
        r = ?2?;
        b = ?3?;
        a = ?4?;
    }
    if( a == 0)
        return ?5?;
    else
        return -1;
}
```

- i. What is the expression or statement at ?1?
- ii. What is the expression or statement at ?2?
- iii. What is the expression or statement at ?3?
- iv. What is the expression or statement at ?4?
- v. What is the expression or statement at ?5?

**PART - II**

**Answer SIX questions in this part, choosing TWO questions from Section A, TWO questions from Section B and TWO questions from Section C.**

**SECTION - A**

**Answer any TWO questions from this Section.**

**Question 4**

- (a) Given the Boolean function  $F(M, N, O, P) = \Sigma(0, 1, 2, 3, 4, 6, 8, 9, 10, 11, 14)$
- (i) Reduce the above expression by using 4-variable Karnaugh map, showing the various groups ( i.e. octal, quad and pairs). [4]
  - (ii) Draw the logic gate diagram for the reduced expression. Assume that the variables and their complements are available as inputs. [1]
- (b) Given the Boolean function  $F(A, B, C, D) = \pi(0, 2, 4, 5, 6, 7, 8, 10, 13, 15)$
- (i) Reduce the above expression by using 4-variable Karnaugh map, showing the various groups ( i.e. octal, quad and pairs). [4]
  - (ii) Draw the logic gate diagram for the reduced expression Using NOR gates only. Assume that the variables and their complements are available as inputs. [1]

**Question 5**

- (a) Draw the logic circuit diagram for a Binary to Decimal Encoder. Also differentiate between Encoder and Decoder. [5]
- (b) A person is suffering from COVID , if he has any of the following symptoms:  
He has high fever and sore throat.

**OR**

He doesn't have high fever but has sore throat and suffering in breathing.

**OR**

He is suffering in breathing and loss of taste or smell.

The inputs are:

- F - has high fever  
S - has sore throat  
B - difficulty in breathing  
T - loss of taste or smell

(1 indicate 'Yes' and 0 indicates 'No')

Output:

C - suffering from COVID (1 indicate 'Yes' and 0 indicates 'No')

Draw a truth table for inputs and output given above and write SOP expression for C(F, S, B, T). [5]

**Question 6**

- (a) Define Multiplexer also write 2 uses of Multiplexer. Draw a logic circuit of 8:1 Multiplexer. [5]
- (b) Convert the following to its Canonical form:  
 $F(P, Q, R, S) = \Sigma(2, 3, 6, 11)$  [2]
- (c) Draw the truth table and derive POS form of sum and carry for the full Adder. Also draw logic gate diagram of full adder. [3]

## SECTION B

Answer any TWO questions from this section.

Each program should be written in such a way that its clearly depicts the logic of the problem.

This can be achieved using mnemonic name and comments in the program.

### Question 7

[10]

A class **OctDeci** has been defined to convert an octal number to its equivalent decimal number as.

e.g. oct =  $654_8$  then dec =  $6 \times 8^2 + 5 \times 8^1 + 4 \times 8^0 = 428_{10}$

The details of the class are given below :

<b>Class name</b>	:	OctDeci
<b>Data members/instance variables</b>		
oct	:	integer to store a octal number
dec	:	integer to store a decimal number
<b>Member function/methods</b>		
OctDeci(int x)	:	Constructor to assign oct = x and dec = 0.
int deci_oct(int num,int i)	:	Calculate and return decimal equivalent of 'num' using recursive technique.
void display()	:	Display the original number 'oct' and its decimal equivalent.

Specify the class OctDeci giving details of the constructor and functions int deci\_oct(int,int) and void display( ). Define a main( ) function to create an object and call the functions accordingly to enable the task.

### Question 8

[10]

Design a class **WordWise** to separate words from a sentence and find the frequency of the vowels in each word.

Some of the members of the class are given below:

<b>Class name</b>	:	WordWise
<b>Data members/instance variables :</b>		
str	:	to store a sentence
<b>Member functions/methods:</b>		
WordWise( )	:	default constructor
void readsent( )	:	to accept a sentence
int freq_vowel(String w)	:	returns the frequency of vowels in the parameterized string w
void arrange( )	:	displays each word of the sentence in a separate line along with the frequency of vowels for each word by invoking the function freq_vowel( )

Define the class WordWise giving details of the constructor( ), void readsent(), int freq\_vowel(String) and void arrange(). Define the main( ) function to create an object and call the functions accordingly to enable the task.

### Question 9

Design a class **MatPalin** to display only palindrome numbers in the matrix.

[Palindrome number : A number which is same as its reverse] Examples: 11, 131 etc.

If the number is not palindrome then add reverse of the number to make it palindrome. As if the number is 14 then concatenate 41 to the number to make it palindrome as 1441. Example:

Original Matrix	Resultant Matrix
2 12 33	2 1221 33
14 88 9	1441 88 9
1 7 44	1 7 44

Some of the members of the class are given below:

**Class name** : MatPalin

**Data members/instance variables:**

mat[ ][ ] : to store integer elements

m : to store number of rows

n : to store number of columns

**Methods/Member functions:**

MatPalin(int a, int b) : parameterized constructor to initialize the data members  
m = a and n = b

void accept( ) : to enter elements in the array.

void display( ) : displays the array elements in matrix form.

int Rev(int x) : returns the reverse of the number 'x'.

void generate(MatPalin P) : make palindrome of each number (if it is not a palindrome)  
of the array of parameterized object and stores it in the  
array of current object.

Specify the class MatPalin giving details of the constructor, void accept(), void display(),  
int Rev(int x) and void generate(MatPalin P). Define a main() function to create object(s) and  
call the functions accordingly to enable the task.

### SECTION C

**Answer any Two questions from this section.**

**Each program / Algorithm should be written in such a way that it clearly depicts the  
logic of the problem.**

**This can be achieved using mnemonic name and comments in the program.**

#### Question 10

[5]

The following function Mystery() is a part of some class. What will the function Mystery() return  
when the value of num = 198127, x = 4 and y = 5 respectively? Show the dry run/working.

```
int Mystery(int num, int x, int y)
{
    if(num < 10)
        return num;
    else
    {
        int d = num%10;
        if(d%2 == 0)
            return d*x + Mystery(num/10,x,y);
        else
            return d*y + Mystery(num/10,x,y);
    }
}
```

#### Question 11

[5]

A linear data structure enables the user to add address from rear end and remove address from  
front. Define a class Diary with the following details:

**Class name** : Diary

**Data members / instance variables:**

Q[ ] : array to store the addresses

size : stores the maximum capacity of the array  
 start : to point the index of the front end  
 end : to point the index of the rear end

**Member functions :**

Diary (int max) : constructor to initialize the data member size = max, start = 0 and end = 0  
 void pushadd(String n) : to add address in the diary from the rear end if possible, otherwise display the message " NO SPACE"  
 String popadd( ) : removes and returns the address from the front end of the diary if any, else returns "?????"  
 void show( ) : displays all the addresses in the diary

Specify the class Diary giving details of the functions void pushadd(String) and String popadd( ). Assume that the other functions have been defined.

The main function and algorithm need NOT be written.

**Question 12**

[5]

The following is a function of some class which checks if a positive integer is a Palindrome number by returning true or false. (A number is said to be palindrome if the reverse of the number is equal to the original number.) The function does not use modulus (%) operator to extract digit. There are some places in the code marked by ?1?, ?2?, ?3?, ?4?, ?5? which may be replaced by a statement / expression so that the function works properly.

```
boolean PalindromeNum( 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;
}
```

- i. What is the statement or expression at ?1?
- ii. What is the statement or expression at ?2?
- iii. What is the statement or expression at ?3?
- iv. What is the statement or expression at ?4?
- v. What is the statement or expression at ?5?

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