

Part II [50 marks]

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).

Question : 4

- a) Given the Boolean Function : $F(A, B, C, D) = \pi(1, 3, 5, 7, 8, 9, 10, 13, 14, 15)$.
- (i) Reduce the above expression by using 4 variable k-map, showing the various groups (i.e. octal, quads and pairs) [4]
- (ii) Draw the logic gate diagram for the reduced expression. Assume that the variable and their complements are available as input. [1]
- b) Given the Boolean Function :
- $$P(A, B, C, D) = ABC'D + A'BC'D + A'BC'D + ABC'D + A'BCD + ABCD :$$
- (i) Reduce the above expression by using 4-variables k-map, showing the various groups. (i.e. octals, quads and pairs). [4]
- (ii) Draw the logic gate diagram for the reduced expression. Assume that the variable and their complements are available as input. [1]

Questions : 5

- a) Verify using a truth table if : $(A \odot B \odot C)' = A \oplus B \oplus C$. [3]
- b) Verify if the following is valid : $(a \Rightarrow b) \wedge (a \Rightarrow c) = a \Rightarrow (b \wedge c)$. [3]
- c) What is a Decoder? Draw the truth table and logic circuit diagram for a 3:8 Decoder. [4]

Questions : 6

- a) Define the term contingency, contradiction and Tautology. [3]
- b) Consider the following truth table where A and B are two inputs and x is the output : [2]

A	B	X
0	0	0
0	1	1
1	0	1
1	1	0

- (i) Name and draw the logic gate for the given truth table.
- (ii) Write the POS of x (A, B)
- c) An event organizing company to promote musical talent wants to organise a musical concert. It considers the participation of applicants on the following basis : [5]
- * Applicant has cleared the screening upto phase II and has undergone a musical training of at least 3 years.
- OR
- * Applicant is recommended by an institute of repute and has undergone a musical training of at least 3 years.

OR

Applicant has won a state or national event of music

Inputs :

R : recommended by an institute of repute

S : Cleared the screening up to phase II

T : Undergone musical training of 3 year or more

W : Won a state or a national level event of music

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

C : Denotes applicant is considered for participation [1 indicates yes and 0 indicates no].

Draw the truth table for the input and outputs given above and write POS expression.

Section B

(Answer any **two** questions)

The programs must be written in Java

Questions : 7

Design a class vowel_word to accept a sentence and calculate the frequency of words that begin and end with vowel. The words in the input string are separated by a single blank space and terminated by a full stop. The description of the class is given below : [10]

Class name : vowel_word

Data members /Instance variables –

str : to store a string

C : to store the frequency

Member function :

vowel_word () : to store the default values in the data members.

void input () : to read the value of str

void countfrequency () : to count the frequency of words starting and ending with vowels also display those words.

void display () : to display the original string as well as frequency stored in c.

Questions : 8

A class split contains an array of integers which splits an array into two arrays one of odd numbers and other of even numbers and sorts them. Some of the members of the class are as follows : [10]

Class name : split

Data members/instance variables –

spl [] : integer array

size : size of the array

Member functions –

split (int x) : parameterized constructor to assign size = x.

void input () : to accept array elements.

void sort () : sorts the elements of the array after splitting, in ascending order using selection sort technique.

split breakit (split A) : Splits the array contained in the split object A into two separate arrays (as described in the question) and stores them in the current split object. Returns the new split object.

Specify the class split giving details of the constructor (int), void input (), void sort (), and split breakit (split). Also define the main () function to create objects and call the methods accordingly to

Questions : 9

Define a class Palindrome to check whether the word is palindrome or not. Palindrome words are the words which reads same from forwards and reverse. [10]

Class name	:	Palindrome
Data members/instance variables –		
txt	:	store a word
revtxt	:	to store the reverse of the text stored in int.
len	:	to store the length of string text
Member functions –		
Palindrome ()	:	default constructor
void input (String s)	:	assigns the parameter value to the variable txt.
void reverse (int l)	:	to reverse the string txt and store it in variable revtxt considering the initial value of l as 0. Using recursive technique
void display ()	:	to print the value of txt and revtxt
void check ()	:	to check whether the string is palindrome or not and display proper message

Also define a main () function to create an object and call the methods.

Section C

(Answer any two questions)

Question : 10

Link is an entity which can hold a maximum of 100 integers. Link, enables the user to add element from the top and remove integer from the top of the entity. Define a class link with the following details : [5]

Class Name	:	Link
Data Members / instance variables :		
lnk []	:	entity to hold the integer elements.
max	:	stores the maximum capacity of the entity.
top	:	to point to the index of the top.
Member function :		
Link (int m)	:	Constructor to initialize max = m and top = -1
void addlink (int v)	:	to add an element at the top index if possible otherwise display the message "Out of size".
int dellink ()	:	to remove and return an element from top index, if possible otherwise display the message "Empty ..." and return -9999.
void display ()	:	to display the elements of the entity.

Questions : 11

A line on a plane can be represented by coordinates of the two end points p1 and p2 as p1 (x1, y1) and p2 (x2, y2). A super class plane is defined to represent a line and a sub class circle to find the length of the radius and the area of circle by using the required data members of super class some of the members of both the classes are given below : [5]

Class Name	:	Plane
Data members / instance variables :		
x1	:	to store the x – coordinate of the first end point
y1	:	to store the y – coordinate of the first end point

Questions : 12

Plane (int nx, int ny) : Parameterized constructor to assign the data members x1 = nx and y1 = ny, to display the coordinates

Circle : to display the coordinates

Class name : Circle

Data Members/instance variables -

x2 : to store the x-coordinate of second end.

y2 : to store the y-coordinate of second end.

radius : double variable to store the radius of circle

area : double variable to store the area of circle

Member functions / methods -

Circle (...)

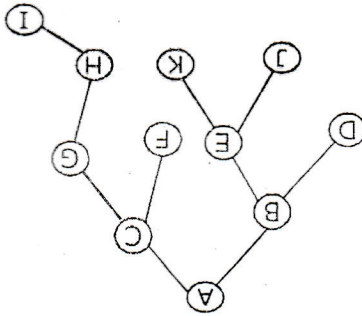
void findRadius () : to calculate the length of radius using the formula :
$$\frac{\sqrt{(x2 - x1)^2 + (y2 - y1)^2}}{2}$$

void findArea () : to find the area of circle using formula πr^2 . The Pie (π) is 3.14.

void show () : to display both the coordinate along with the length of the radius and area of the circle.

Assume that the super class. Plane has been defined. Using the concept of inheritance specify the class. Circle giving details of the constructor (----), void findradius (), void findArea (), void show ().

a) Answer the following questions from the diagram of a binary tree given below :



- (i) Write the inorder travel of the above tree structure. [1]
- (ii) Name the parent of the node B and G. [1]
- (iii) Name the leaves of the right sub tree. [1]

b) A linked list is formed from the objects by the class Node. The class structure of the Node is given below : [2]

```

class Node
{
String name;
Node next;
}
    
```

Write an Algorithm OR a method to search for a given name in the linked list. The method of declaration is given follow.

boolean searchName (Node start, String v).