

Self Assessment Paper

General Instructions :

- (i) Answer all questions in Part I (Compulsory) and six questions from Part-II, choosing two questions from Section –A, two from Section –B and two from Section-C.
- (ii) All working, including rough work, should be done on the same sheet as the rest of the answer.
- (iii) The intended marks for questions or parts of questions are given in brackets [].

PART I (20 MARKS)

Answer all questions.

While answering question in this Part, indicate briefly your working and reasoning, wherever required

Question 1

Answers all questions:

- (a) If $(X \Rightarrow Y)$ then write its
 - (i) Converse
 - (ii) Contrapositive[1]
- (b) Find the complement of the following Boolean expression using De Morgan's law. [1]
 $F(x, y, z) = (x' + y') + z$
- (c) Differentiate between Canonical form and Cardinal form of expression. [1]
- (d) Write the maxterm and minterm, when the inputs are $A = 0, B = 1, C = 1$ and $D = 0$. [1]
- (e) Draw a logic circuit $(A + B) \cdot C.D$ [1]

Question 2

Answers all questions:

- (a) Convert the following infix expression to postfix from $P*Q/R+(S+T)$. [2]
- (b) What is meant by visibility mode in the definition of derived classes in Inheritance? Explain any two visibility modes available. [2]
- (c) State the following
 - (i) Recursion
 - (ii) Finite recursion[2]
- (d) An array $AR[-4 \dots 6, -2 \dots 12]$ stores elements in row major wise, with the address $AR[2][3]$ as 4142. If each element requires 2 bytes of storage, find the base address.. [2]
- (e) How would the complexity change if the second loop went on N instead of M? [2]

Question 3

The following function `Check( )` is a part of some class. What will the function `Check( )` return when the values of both 'm' and 'n' are equal to 5? Show the dry run/working. [5]

`int Check (int m, int n)`

```

{
if (n == 1)
    return - m --;
else
    return + + m + Check (m, --n);
}

```

PART II (50 MARKS)

Answer **six** questions in this part, choosing **two** questions from Section A, **two** from Section B and **two** from Section C.

SECTION 'A'

Answer any two questions:

Question 4

- (a) Given the boolean functions $F(A, B, C, D) = \Sigma (2, 3, 4, 5, 6, 7, 8, 10, 11)$
- Reduce the above SOP expression by using 4-variable K-map, showing the various groups (i.e., octet, quads and pairs). [4]
 - Draw the logic gate diagram of the reduced SOP expression. Assume that the variables and their complements are available as inputs. [1]
- (b) Given the boolean functions $F(P, Q, R, S) = \Pi (0, 1, 2, 4, 5, 6, 8, 10)$
- Reduce the above POS expression by using 4-variable K-map, showing the various groups (i.e., octet, quads and pairs). [4]
 - Draw the logic gate diagram of the reduced POS expression. Assume that the variables and their complements are available as inputs. [1]

Question 5

- (a) Draw the truth table and logic circuit diagram for a hexadecimal to binary encoder. [5]
- (b) Reduce the following expression using Boolean laws: [2]
 $F(A, B, C, D) = (A' + C) \cdot (A' + C') \cdot (A' + B' + C'D)$
- (c) Verify that $(z + x)(z + x' + y) = (z + x)(z + y)$. [3]

Question 6

The principal of a school intends to select students for admission to class XI on the following criteria:

- Student is of the same school and has passed the class X Board Examination with more than 60% marks.

OR

- Student is of the same school, has passed the class X Board Examination with less than 60% marks but has taken active part in co-curricular activities.

OR

- Student is not from the same school but has either passed the class X Board Examination with more than 60% marks or has participated in sports at the national level.

The inputs are:

Inputs	
S	Student of the same school
P	Has passed the class X Board Examination with more than 60%
C	Has taken active part in co-curricular activities
T	Has participated in sports at the national level

Output X: Denotes admission status [1 indicates granted and 0 indicates refused in all the cases].

- Draw the truth table for the inputs and output given above and write the SOP expression. [5]
- Reduce $X(S, P, C, T)$ using Karnaugh's Map. Draw the logic gate diagram for the reduced SOP

To know about more useful books for class-12 [click here](#)

expression for $X(S, P, C, T)$ using AND and OR gate. You may use gates with two or more inputs. Assume that the variables and their complements are available as inputs. [5]

SECTION 'B'

Answer any two questions:

Question 7

A Happy number is a number in which the eventual sum of the square of the digits of the number is equal to 1. e.g.,

$$28 = (2)^2 + (8)^2 = 4 + 64 = 68$$

$$68 = (6)^2 + (8)^2 = 36 + 64 = 100$$

$$100 = (1)^2 + (0)^2 + (0)^2 = 1 + 0 + 0 = 1$$

Hence, 28 is a happy number.

$$\text{e.g. } 12 = (1)^2 + (2)^2 = 1 + 4 = 5$$

Hence, 12 is not a happy number.

Design a class Happy to check if a given number is a happy number.

Some of the members of the class are given below:

Class name	Happy
Data member/Instance variable:	
n	store the numbers
Member functions	
Happy ()	constructor to assign 0 to n
void getnum (int nn)	to assign the parameter value to the number $n = nn$
int sum_sq_digits (int x)	returns the sum of the square of the digits of the number x , using the recursive technique.
void ishappy ()	checks if the given number is a happy number by calling the function sum_sq_digits(int) and displays an appropriate message.

Specify the class Happy giving details of the constructor (), void getnum (int), int sum_sq_digits(int) and void ishappy (). Also define a main () function to create an object and call the methods to check for happy number. [10]

Question 8

A class Adder has been defined to add any two accepted time

e.g

Time P = 5 hours 45 minutes

Time Q = 3 hours 25 minutes

Their sum is 9 hours 10 minutes (where 60 minutes=1 hour)

The details of the members of the class are given below

[10]

Class Name	Adder
Data member/instance variable	
arr[]	integer array to hold two elements(hours and minutes)
Member functions	

Adder()	constructor to assign 0 to the array elements
void readtime()	to enter the elements of the array
void addtime(Adder X, Adder Y)	adds time of the two parameterized objects X and Y and stores the sum in the current calling object
void disptime()	display the array elements with an appropriate message (i.e. hours= and minutes=)

Specify the class Adder giving details of the constructor(), void readtime(), void addtime(Adder, Adder) and void disptime(). Define the main() function to create objects and call the functions accordingly to enable the task.

Question 9

A class SwapSort has been defined to perform string related operations on a word input. Some of the members of the class are as follows: [10]

Class Name	SwapSort
Data members/ instance variables:	
wrd	to store a word
len	integer to store length of word
swapwrd	to store the swapped word
sortwrd	to store the sorted word
Member functions/Methods:	
SwapSort()	default constructor to initialise data members with legal initial values
void readword()	to accept a word in UPPERCASE
void swapchar()	to interchange / swap the first and last characters of the word in wrd and stores the new word in swapwrd
void sortword()	sorts the characters of the original word in alphabetical order and stores it in sortwrd
void display()	displays the original word, swapped word and the sorted word

Specify the class SwapSort, giving details of the constructor(), void readword(), void swapchar(), void sortword() and void display(). Define the main() function to create an object and call the functions accordingly to enable the task.

SECTION 'C'

Answer any two questions:

Question 10

A super class Bank has been defined to store the details of a customer. Define a sub-class Account that enables transactions for the customer with the bank. The details of both the classes are given below:

Class Name	:	Bank
Data members/instance variables:		
name	:	stores the name of the customer
accno	:	stores the account number
p	:	stores the principal amount in decimals
Member functions/methods:		

To know about more useful books for class-12 [click here](#)

Bank(...)	:	parameterized constructor to assign values to the instance variables
void display()	:	displays the details of the customer

Class Name	:	Account
Data member/instance variable:		
amt	:	stores the transaction amount in decimals
Member functions/methods:		
Account(...)	:	parameterized constructor to assign value to the instance variables of both the classes
void deposit()	:	accepts the amount and updates the principal as $p = p + \text{amt}$
void withdraw ()	:	accepts the amount and updates the principal as $p = p - \text{amt}$ If the withdrawal amount is more than the principal amount, then display the message "INSUFFICIENT BALANCE". If the principal amount after withdrawal is less than 500, then a penalty is imposed by using the formula $p = p - (500 - p)/10$
void display ()	:	displays the details of the customer

Assume that the super class Bank has been defined. Using the concept of Inheritance, specify the class Account giving details of the constructor(...), void deposit(), void withdraw() and void display(). The super class and the main function need not be written. [5]

Question 11

Queue is an entity which can hold a maximum of 50 integers. The queue enables the user to add integers from the rear and remove integers from the front.

Define a class Queue with the following details :

Class Name	Maximum
Data members/instance variables:	
Q[]	array to hold the integer elements
n	stores the size of the array
rear	to point the index of the rear
Member functions:	
Q (int nn)	constructor to initialize the data size = mm, front = 0, rear = 0
void add (int v)	to add integer from the rear if possible else display the message "Overflow".
int del()	returns elements from front if present, otherwise displays the message "Underflow" and return -9999
void print ()	display the array elements

Specify the class Maximum giving details of ONLY the functions void add(int) and int del(). Assume that the other functions have been defined. The main function and algorithm need NOT be written.

[5]

Question 12

(a) A linked list is formed from the objects of the class N. The class structure of the N is given below :

To know about more useful books for class-12 [click here](#)

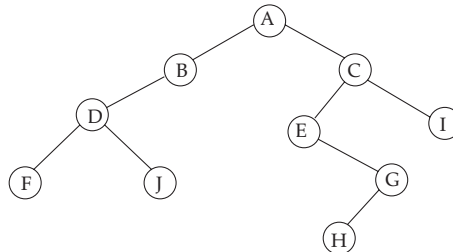
```

class N
{
    int a, n1 ;
    N temp ;
}

```

Write an algorithm to find and display the total of integers that placed at even position from an existing linked list.

(b) Answer the following questions from the diagram of a Binary Tree given below:



- (i) Write the inorder traversal of the above tree structure.
- (ii) Name the parent of the nodes B and G.
- (iii) Name the leaves of the right sub-tree.

[3]



Finished Solving the Paper ?
Time to evaluate yourself !
<https://qr.go.page.link/n1BcV>

OR

SCAN THE CODE



For elaborate
Solutions

**OSWAAL COGNITIVE
LEARNING TOOLS**

