

PRE BOARD EXAMINATION: 2022-23

CLASS –XII

SUBJECT –COMPUTER SCIENCE

MaximumMarks:70

TimeAllowed:3hours

*(Candidates are allowed **additional 15 minutes for only** reading the paper. They must **not** start writing during this time.)*

Answers **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**.

All working including rough work should be done on the same sheet.

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

PART – I (20 Marks)

(Attempt all questions)

Question 1:

- (i) If $A=1, B=0, C=0$ and $D=1$, then MINTERM will be [1]
a. $A+B+C'+D$
b. $AB'C'D$
c. $A'+B+C+D'$
d. $AB'C'D'$
- (ii) If $F(A,B,C)=\sum(0,2,3,5)$ Then canonical SOP will be [1]
a. $AB'C'+A'BC'+A'BC+AB'C$
b. $(A+B+C')(A'+B+C).(A'+B'+C)(A'+B'+C')$
c. $(A'+B'+C')(A'+B+C).(A'+B'+C)(A'+B'+C')$
d. $A'B'C'+A'BC'+A'BC+AB'C$
- (iii) The Following proposition $(\sim P \wedge Q) \vee (P \wedge \sim Q) \vee (\sim P \wedge \sim Q)$ is equal to [1]
a. $(\sim P \wedge \sim Q)$
b. $\sim(P \wedge Q)$
c. $\sim(P \vee \sim Q)$
d. $\sim P + \sim Q$
- (iv) What is the contrapositive for the given proposition $A \vee \sim B \rightarrow C$ [1]
a. $\sim A \vee B \rightarrow \sim C$
b. $C \rightarrow A \vee \sim B$
c. $\sim C \rightarrow \sim(A \vee \sim B)$
d. NONE OF THESE
- (v) The law which states $X + X'Y = X + Y$ is: [1]
a) Commutative Law
b) Distributive Law
c) Absorption Law
d) Involution Law
- (vi) Name the combinational circuit capable of adding two 2-bit numbers. [1]
- (vii) State one purpose of using new operator in Java. [1]
- (viii) What is Queue data structure? [1]
- (ix) Define Interface? Write the keyword for using interface in a class. [1]
- (x) State any one purpose of using the keyword super in Java Programming. [1]

Question 2:

- (i) A matrix A[m] [n] is stored with each element requiring 4 bytes of storage. If the base address at A[1] [1] is 1500 and the address at A [4] [5] is 1608, determine the number of rows of the matrix when the matrix is stored in Column Major Wise. [2]
- (ii) Convert the following infix expression into postfix form: $A + B / C * (D/E * F)$ [2]
- iii) The following function Check() is a part of some class. What will the function Check() return when the values of both 'm' and 'n' is 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

(Attempt any two questions)

Question 3:

- (a) Given the Boolean function $F(A, B, C, D) = \pi (0, 1, 2, 3, 5, 7, 8, 9, 10, 11)$.
 - (i) Reduce the above expression by using 4-variable Karnaugh 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 variables and their complements are available as inputs. [1]
- (b) Given the Boolean function $P (A, B, C, D) = ABC'D' + A'BC'D' + ABC'D + ABC'D + ABC'D + ABCD$
 - (i) Reduce the above expression by using the 4-variable Karnaugh 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 variables and their complements are available as inputs. [1]

Question 4.

(a) A person is allowed to travel in a reserved coach of the train if he/she satisfies the criteria given below: [5]
The person has a valid reservation ticket and a valid ID proof.

OR

The person does not have a valid reservation ticket but holds a valid pass issued by the Railway department with a valid ID proof.

OR

The person is a disabled person and holds a valid pass issued by the Railway department along with a valid ID proof.

The inputs are:

R	The person has a valid reservation ticket.
P	The person holds a valid pass issued by the Railway department.

D	The person has valid ID proof.
H	A person is a disabled person.

(In all the above cases 1 indicates Yes and 0 indicates No).

Output: T [1 indicates Yes, 0 indicates No for all cases]

Draw the truth table for the inputs and outputs given above and write the POS expression for T(R, P, D, H).

(b) Differentiate between Half Adder and Full Adder. Draw the circuit diagram and truth table for Full Adder [3]

(c) Simplify the following expression, using Boolean laws: [2]

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

Question 5.

(a) Draw the truth table and logic gate diagram for an Octal to Binary encoder. [4]

(b) What is Multiplexer? State an application of a Multiplexer. Also, draw the logic diagram of a 4 : 1 Multiplexer. [4]

(c) Verify the following expression using Boolean laws. Also, mention the law used at each step of simplification. $X.Y.Z + X.Y'.Z + X.Y.Z = X.(Y + Z)$ [2]

SECTION – B

Answer any two questions

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

This can be achieved by mnemonic names and comments in the program.

(Flowcharts and Algorithms are **not** required)

The programs must be written in JAVA.

Question 6. [10]

A class Admission contains the admission numbers of 100 students. Some of the data members/member functions are given below:

Class name: Admission

Data member/instance variable:

Adno[] : integer array to store admission numbers

Member functions/methods:

Admission() : constructor to initialize the array elements

void fill Array() : to accept the elements of the array in ascending order

int binSearch(int l, int u, int v): to search for a particular admission number (v) using binary search and recursive technique and returns 1 if found otherwise returns -1

Specify the class Admission giving details of the constructor, void fill Array() and int binSearch(int, int, int).

Define the main() function to create an object and call the functions accordingly to enable the task.

Question 7. [10]

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:

Class name: SwapSort

Data members/instance variables:

wrd: to store a word
len: integer to store the length of the word
swapwrd: to store the swapped word
sortwrd: to store the sorted word

Member functions/methods:

SwapSort(): default constructor to initialize data members with legal initial values
void readword(): to accept a word in UPPER CASE
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 the 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.

Question 8.

[10]

A class Adder has been defined to add any two accepted time. [10]

Example:

Time A – 6 hours 35 minutes

Time B – 7 hours 45 minutes

Their sum is – 14 hours 20 minutes (where 60 minutes = 1 hour)

The details of the members of the class are given below:

Class name : Adder

Data member/instance variable:

a[] : integer array to hold two elements (hours and minutes)

Member functions/methods:

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 the time of the two parameterized objects X and Y and stores the sum in the current calling object

void disptime(): displays 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.

SECTION – C

Answer any two questions

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

This can be achieved by using comments in the program and mnemonic names or pseudo codes for algorithms. The programs must be written in Java and the algorithms must be written in general / standard form, wherever required/ specified.

[Flowcharts are **not** required]

Question 9

[5]

A superclass Number is defined to calculate the factorial of a number. Define a subclass Series to find the sum of the series $S = 1! + 2! + 3! + 4! + \dots + n!$ [5]

The details of the members of both classes are given below:

Class name : **Number**

Data member/instance variable:

n : to store an integer number

Member functions/methods:

Number(int nn) : parameterized constructor to initialize the data member n=nn

int factorial(int a) : returns the factorial of a number

(factorial of n = $1 \times 2 \times 3 \times \dots \times n$)

void display() : display the data members of the class

Class name : **Series**

sum : to store the sum of the series

Member functions/methods:

Series(...) : parameterized constructor to initialize the data members of both the classes

void calsum() : calculates the sum of the given series

void display() : displays the data members of both the classes

Assume that the superclass Number has been defined. Using the concept of inheritance, specify the class Series giving the details of the constructor(...), void calsum() and void display(). The superclass, main function and algorithm need NOT be written.

Question 10

A register is an entity which can hold a maximum of 100 names. The register enables the user to add and remove names from the topmost end only.

Define a class Register with the following details:

Class name : **Register**

Data members/instance variables:

stud[] : array to store the names of the students

cap : stores the maximum capacity of the array to point the index of the top end

top : to point the index of the top end

Member functions:

Register (int max) : constructor to initialize the data member cap = max, top = -1 and create the string array

void push(String n) : to add names in the register at the top location if possible, otherwise display the

message "OVERFLOW" String pop(): removes and returns the names from the topmost location of the register if any, else returns "\$\$"

void display () : displays all the names in the register

(a) Specify the class Register giving details of the functions void push(String) and String pop().

Assume that the other functions have been defined.

[4]

The main function and algorithm need NOT be written.

(b) Name the entity used in the above data structure arrangement.

[1]

Question 11

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

class Node

```
{  
int n;
```

Node link;

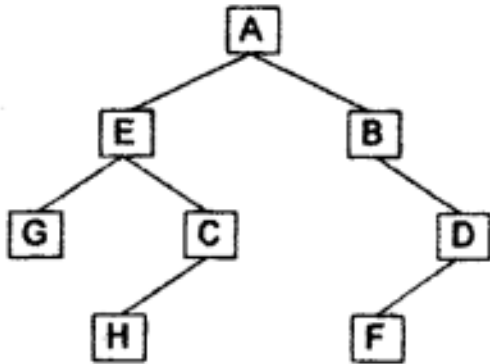
}

Write an Algorithm OR a Method to search for a number from an existing linked list.

The method declaration is as follows:

void FindNode(Node str, int b)

(b) Answer the following from the diagram of a binary Tree



- (i) Write the in-order tree traversal of the tree. [1]
- (ii) Name the Leaves of the tree [1]
- (iii) Size of the tree [1]