

**II PRE BOARD EXAMINATION
COMPUTER SCIENCE**

Paper 1

(THEORY)

Three hours

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

*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 brackets [].

PART - I

Attempt **all** questions.

*While answering questions in this Part, indicate briefly your working
and reasoning, wherever required.*

Question 1

[5 × 1 = 5]

- (a) Write the two complement properties and prove anyone using Truth Table.
 - (b) Write the two input conjunction and disjunction.
 - (c) Verify if $A' \Rightarrow B = A \Leftrightarrow B'$
 - (d) Define time and space complexity.
 - (e) State the difference between nextInt() and hasNextInt() functions.
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This paper consists of 8 printed pages.

Question 2**[5 × 2 = 10]**

- (a) Simplify the $F(A, B, C, D) = (A' + C)(A' + C)(A' + B + C'D)(B' + C)$ using laws.
- (b) Convert the following infix expression to its postfix form:-
 $A * (B + C/D) / (E - F * G) * H$
- (c) In Wff using Boolean laws conclude the following premises is valid, invalid or satisfiable :
 $F(X, Y, Z) = (X \leftrightarrow Z) \cdot [(X \leftrightarrow Y) \cdot (Y \leftrightarrow Z)]$
- (d) For an array of real numbers $x[-6...8, -12... 20]$, find the address of $x[5][4]$, if $x[1][1]$ is stored in location 100 in the column major order. Assume that each element requires 4 bytes.
- (e) Explain the term complexity. Write the example for $O(\log n)$ and $O(n \log n)$ complexity.

Question 3**[5]**

```
static int print(int m,int n)
```

```
{  
    if(n > m ) return n - = m;  
    else return n++ + --m + print ( m- , ++n );  
}
```

What value will return of the function $\text{print}(10,2)$?

PART - II

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

SECTION - A

Answer any two questions.

Question 4

[2 × 5 = 10]

- (a) Given the Boolean function $F(A, B, C, D) = \Sigma(0,1,2,4,5,6,8,9,10,11,12,14)$

Use Karnaugh's map to reduce the given function F, Draw a logic diagram using two input gate.

- (b) $F(A, B, C, D) = \pi(0, 2, 3, 8, 10, 11, 12, 13, 14, 15)$

Draw Karnaugh's map to reduce the given function X. Draw a logic diagram using NOR gate only

Question 5

[5 × 2 = 10]

- (a) Write the $(A \wedge B) \vee (A \Rightarrow B)$ using Nor Gate only.
- (b) Simplify using propositional laws $a'b + be' + a'c$
- (c) Draw the Binary Search Tree for the values (50, 20, 90, 30, 70, 45, 85, 35, 65, 25, 75).
- (d) What is the purpose of try {} catch {} block in exception handling?
- (e) State how an encoder is different from a multiplexer. Also state one use of each.

Question 6

- (a) Draw the truth table & logic gate for a half adder. Also derive a POS expression for the half adder.

[3]

- (b) A combinational logic circuit with three inputs P, Q, R produce output 1 if and only if an odd number of 0's are input.
- (i) Draw its truth table. [1]
- (ii) Derive a canonical SOP expression for the above truth table. [1]
- (c) Find the complement of the above derived expression using De Morgan's theorem and verify if it is equivalent to its POS expression. [2]
- (d) Draw the logic gate diagram for 8 : 1 Multiplexer. [3]

SECTION - B

Answer any two questions

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

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

Question 7

[10]

A special number is a number in which the sum of digit and product of digit addition equals to number

example, $59 = (5 + 9) + (5 * 9) = 14 + 45 = 59$

Class name : Special

Data members

N : stores the number

Sun : store the sum of digits

Member Functions

Special () : constructor to assign 0 to n

void getnum(int nn) : to assign the value to the number,

Calculate the sum of the digits of number of x

void SOD(int x) : using recursion
int prod (int x) : Calculate the product of digit using recursion
void isSpecial() : check n is special number or not.

Specify the class Special by giving details of the constructor, void getnum(int), void SOD(int), int prod(int) and void isSpecial(). You need not write the main function.

Question 8

[10]

Design a class Matrix to shift each row forward first row become last row and second become first row and so on in new matrix. The details of the members of the class are given below :

Class name : Matrix

Data members

arr[][] : stores the matrix elements
M : integer to store the number of rows.
N : integer to store the number of columns.

Member functions

Matrix() : default constructor.
Matrix(int mm,int nn) : to initialize the size of the matrix, m = mm, n = nn.
to enter elements into the matrix.
void fillarray() : to shift each row forward a given matrix and
Matrix shift(Matrix A) : store in current object.
Void displayarray() : displays the array in a matrix form.

Question 9**[10]**

Design a class VowelWord to accept a sentence and calculate the frequency of words that begin with a vowel. The words in the input string (maximum length upto 100 characters) are separated by a single blank space and terminated by a full stop. The description of the class is given below:

Class Name : **VowelWord**
Data members
Str : to store a sentence
Freq : to store the frequency of words beginning with a Vowel and with a consonant

Member functions

vowelWord() : constructor to initialize data members to legal initial value
void readstr() : to accept a sentence
void freq_vowel() : counts the frequency of the words beginning with a Vowel and ends with a consonant
void display() : to display the original string and the frequency of the words that begin with a vowel.

SECTION 'C'

Answer only **two** questions.

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

This can also be achieved by using comments in the program and mnemonic names or pseudocodes for algorithms.

Question 10**[5]**

A super class Detail has been defined to store the details of a parcel. Define a sub class Bill to compute the charge of Parcel :

The details of both the classes are given below :

Class Name : **Detail**

Data members

Name : to store the name of the parcel.
Address : to store the address of the customer.
Telno : to store the phone number of the customer.

Member functions :

Detail(..) : parameterized constructor to assign values to data members.
void show() : to display the detail of the customer.

Class Name : Bill

Data members

w : to store the weight of the parcel into kilograms
Amt : to store the amount to be paid by the customer

Member functions :

Bill(..) : parameterized constructor to assign values to data Members of both classes and to initialize amt = 0.0.
void cal() : calculates the amount according to weight
For the first kilogram 50 Rs then for every next kilogram 25 per kilogram will be charged
void show() : to display the detail of the customer and amount to be paid.

Assume that the class Detail has been defined already. Using the concept of inheritance, specify the class Bill giving details of the constructor(), void cal() and void show().

[5]

Question 11

Class Name : LinkQueue

Data members

que[] : entity to hold the integer elements.
Max : stores the maximum capacity of the entity.
F and R : to point to the front and Rearindex of the starting

Member functions

Link(int mm) : constructor to initialize max = mm, F = R = - 1.

Void insert (intv) : to add an element at the end of Queue
otherwise display the message " OUT OF SIZE ".

void delete() : to remove the elements from the front end
if possible otherwise display the message " EMPTY..."

Question 12

(a) A Linked List is formed from the objects of the class,

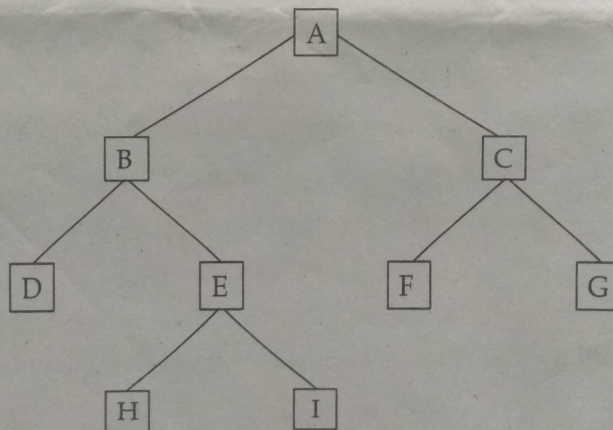
class Node

{ String s; Node next;}

Write an algorithm or a method to Print the String start and end a vowels in the

LinkedList void print(Node Start) [2]

(b) Write the inorder, inetrnal Nodes and the left subtree of the tree. [3]



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