

HALF YEARLY EXAMINATION : 2024-25

Class - XI (ISC)

Time : 3 hrs.

Subject - Computer Science Paper 1

M.M. : 70

(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 from Section-B and two from Section-C.

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

The intended marks for questions or parts of questions 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

- (i) What is the contrapositive for the given proposition $AV\sim B\rightarrow C$ [1]
(a) $\sim AVB\rightarrow\sim C$
(b) $C\rightarrow AV\sim B$
(c) $\sim C\rightarrow\sim(AV\sim B)$
(d) None of these
- (ii) The law which represents the Boolean equation $A + B = B + A$ is: [1]
(a) Associative Law
(b) Distributive Law
(c) Commutative Law
(d) Absorption Law
- (iii) The Hexadecimal equivalent digit of 1011(4 bits form) is _____. [1]
(a) E
(b) F
(c) B
(d) C
- (iv) Choose the correct logic Gates that provide output as 0 when both inputs are the same (either 0 or 1) [1]
(a) XNOR
(b) XOR
(c) NOR
(d) NAND
- (v) Keyword used for instantiation is _____. [1]
(a) import
(b) default
(c) new
(d) public
- (vi) **Assertion(A)**: Boolean algebra and Binary Number system are different from each other.
Reason(R): There are some basic operations like And,Or and Not which are performed in Boolean Algebra. [1]
(a) Both Assertion(A) and Reason(R) are true and the Reason is a correct explanation of the Assertion.
(b) Both Assertion and Reason are true but the Reason is not the correct explanation of Assertion.
(c) Assertion is true, but the Reason is false.
(d) Assertion is false, but the Reason is true.

- (vii) **Assertion(A)**: In Java ,the String class is used to create and manipulate strings, and it is immutable.
Reason(R) : Immutability ensures that once a String object is created ,its value cannot be changed.
- (a) Both Assertion(A) and Reason(R) are true and the Reason is a correct explanation of the Assertion.
 (b) Both Assertion and Reason are true but the Reason is not the correct explanation of Assertion.
 (c) Assertion is true, but the Reason is false.
 (d) Assertion is false, but the Reason is true. [1]
- (viii) Technique in which changes in the formal parameters are reflected back in actual parameters is known as _____.
 (a) Call by value
 (b) Call by reference
 (c) Call by method
 (d) Call by argument [1]
- (ix) Evaluate $(A5E8)_{16} - (5EF)_{16}$ [1]
 (x) What are Wrapper classes? Name any two. [1]

Question 2

- i. Mention Distributive laws. Verify any one using truth table. [2]
 ii. What is the difference between static and instance variables? [2]
 iii. If A denotes "it is cloudy" and B denotes "it will rain", then write its inverse and converse [2]
 iv. The following public function is a part of some class. Assume n is always positive. Answer the given questions. Give the dry run/ working

```

int unknown(int n)
{
    int i, k;
    if(n%2==0) {
        i = n/2;
        k = 1; }
    else {
        k = n;
        n--;
        i = n/2;
    }
    while(i > 0)
    {
        k = k * i * n;
        i--;
        n--;
    }
    return(k);
}

```

- (a) What value will be returned by the expression unknown(7)? [3]
 (b) In one line say what is being computed by the function unknown(int n). [1]

PART - II

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

SECTION - A

Answer any TWO questions.

Question 3

[10]

a. Perform the following conversions / operations:

(i) $(11101.101)_2 = (?)_{10}$

(ii) $(48AE)_{16} = (?)_8$

(iii) $(679)_{10} = (?)_8$

(iv) $1001_2 - 11_2$ (using 2's complement)

(v) $(5526)_8 + (635)_8$

Question 4

(a) A job consultant searches jobs for applicants. The criteria for selecting the job are. The salary is less than 50 K but the firm takes care of the wellness of the employee and provides LTA or HRA.

OR

HRA is provided as well as the firm takes care of the wellness of the employees.

OR

Salary is more than 50K, HRA and LTA is provided by the firm.

Inputs are : S = Salary is more than 50 K

R = HRA is provided

W = Wellness of employees is taken care of.

L = LTA is provided

Output F = Found

In all the cases, 1 indicates yes 0 indicates no.

Draw the truth table for the inputs and outputs given above and derive the conjunction expression for the same.

[5]

(b) Simplify the following using Boolean laws : $A.(B + C).(A . B + A . C)'$

[3]

(c) Using a truth table, verify : $(A + B).(A' + B') = A.B' + A'.B$

[2]

Question 5

(a) What is Half Adder. Draw the truth table and logical circuit diagram for it.

How is it different from Full Adder?

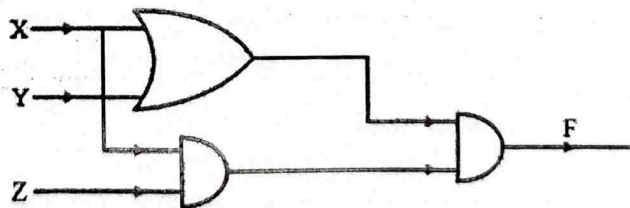
[5]

(b) State the principle of duality. Write the dual of $(P + Q) . P . 1 = P . R + Q' . R$

[2]

(c) From the logic circuit diagram given below, derive the Boolean expression and simplify it to show that it represents a logic gate. Name and draw the logic gate.

[3]



SECTION - B

Answer only 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 using mnemonic names and comments in the program. (Flow charts and Algorithms are not required).

(The program must be written in Java)

Question 6

[10]

An emirp number is a number which is prime backwards and forwards. Example : 13 and 31 are both prime numbers. Thus, 13 is an emirp number.

Design a class Emirp to check if a given number is Emirp number or not. Some of the members of the class are given below :

Class name : Emirp

Data members/instance variables :

n : stores the number

rev : stores the reverse of the number

f : stores the divisor

Member functions :

Emirp(int nn) : to assign n = nn, rev = 0 and f = 2

int isprime(int x) : check if the number is prime and return 1 if prime otherwise return 0

void isEmirp() : reverse the given number and check if both the original number and the reverse number are prime, by invoking the function isprime(int) and display the result with an appropriate message

Specify the class Emirp giving details of the constructor(int), int isprime (int) and void isEmirp(). Define the main function to create an object and call the methods to check for Emirp number.

Question 7

[10]

Input a word in uppercase and check for the position of the first occurring vowel and perform the following operation.

- i) Words that begin with a vowel are concatenated with "Y". For example, EUROPE becomes EUROPEY.
- ii) Words that contain a vowel in between should have the first part from the position of the vowel till end, followed by the part of the string from beginning till position of the vowel and is concatenated by "C". For example PROJECT becomes OJECTPRC.
- iii) Words which do not contain a vowel are concatenated with "N". For example, SKY becomes SKYN.

Design a class Rearrange using the description of the data members and member functions given below:

Class name : Rearrange Data members

Txt : to store a word

Cxt : to store the rearranged word

len : to store the length of the word

Member functions :

Rearrange() : constructor to initialize the instance variables

void readword() : to accept the word input in UPPERCASE

void convert() : converts the word into its changed form and stores it in string Txt

void display() : displays the original and the changed word

Specify the class Rearrange giving the details of the constructor(), void readword(), void convert() and void display(). Define a main function to create an object and call the function accordingly to enable the task.

Question 8

[10]

A class SeriesSum is designed to calculate the sum of the following series:

Sum = $x^1/1! + x^3/3! + x^5/5! + \dots + x^n/n!$

Classname : SeriesSum

Data members:

x : to store an integer number

n : to store number of terms

sum : double variable to store the sum of the series

Member functions :

SeriesSum(int xx, int nn) : constructor to assign x = xx and n = nn

double findfact(int m) : to return the factorial of m

double findpower(int x, int y): to return x raised to the power of y

void calculate() : to calculate the sum of the series by invoking the functions respectively

void display() : to display the sum of the series

Specify the class SeriesSum, giving details of the constructor(int, int), double findfact(int), double findpower(int, int), void calculate() and void display(). Define the main() function to create an object and call the functions accordingly to enable the task.

SECTION - C

Answer only 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 logarithms. The program must be written in Java and the algorithm must be written in general/standard form, whenever required/ specified. (Flow charts are not required).

Questions 9

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 the 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;
}
```

- a. What is the statement or expression at ?1? [1]
- b. What is the statement or expression at ?2? [1]
- c. What is the statement or expression at ?3? [1]
- d. What is the statement or expression at ?4? [1]
- e. What is the statement or expression at ?5? [1]

Questions 10

- (a) Write a function `isPrime(int n)` to return 1 if 'n' is prime otherwise return 0. [3]
- (b) Write a function `last(String sent)` to return the last word of the sentence `sent`. [2]

Questions 11

- a) Explain Autoboxing. [1]
- b) What is Function overloading? [1]
- c) What is Tautology? [1]
- d) Mention one point of difference of pure and impure method. [1]
- e) What is this keyword used for? [1]

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