Time: 3hr
Marks: 80

Computer Science
Answer all questions

Question 1

a) Verify the following boolean expression using truth table
$(A + B) . (A'+ B') = A'. B + A . B'$
[2]
b) If $X = A'BC + AB'C + ABC + A'BC'$ then find the value of X when A=1 ,B=0, C=1 [1]
c) State the following laws and prove it with the help of a truth table
   (i) De Morgan's Law
   (ii) Absorption Law
[4]
d) State the principal of duality. Find the dual of the following boolean expression
   (i) $(P+Q').P.1=P.R+Q'.R$
[3]
   (ii) $X.Y.Z + X.Y.Z' + X.Y'.Z = X.(Y+Z)$
e) Simplify the following expression using Boolean laws and state the law used in each step.
(i) $X'.Y'.Z' + X'.Y'.Z + X'.Y.Z + X'.Y.Z' + X.Y'.Z' + X.Y'.Z$
(ii) $(A + B)'.(A+ B')'$
(iii) $[(p' + q).(q' + r)]' + (p'+ r)$
[6]
f) If $F=X.(Y + Z + X.Y')$ then find F'
[2]

Question 2

a) Give one difference between: (i) constructor and function
                                (ii) Call by value and Call by reference
                                (iii) = operator and = = operator
                                (iv) String and StringBuffer
[4]
b) What is a token? Name different tokens in Java
[3]
c) Define constructor and different types of constructor in Java with an example
[4]
d) What is fall through? Name the exit controlled loop in Java
[1]

Question 3
[10]
a) Find the output for the following:
   (i)   void main()
           {
           int v1=5,v2;
           for(int x=1;x<=5;x++)
            { v2 = x;
              System.out.println((++v1)+(v2--)+(--v2)+(v1++));
            }}

```
ii)  void main()
   {      String s1="Computer",s2="Technology";
          System.out.println(s1.substring(1,5));
       System.out.println(s2.substring(2,5));
       System.out.println(s1.indexOf(s1.charAt(5)));
       System.out.println(s2+s1.substring(6));
       System.out.println(s1.equalsIgnoreCase(s2));

   }
```

b) The following is a public member function of some class, written to do some task.Assume that all the variables used in the function are positive in nature.Answer the questions after the given function.

```
int checkdata(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;

   }
```

(i) What will be returned by the function checkdata(6)?Show the dry run/working
(ii) What will be returned by the function checkdata(7)?Show the dry run/working
(iii)State what is being computed by the function checkdata( ) ?

c) The following is function of some class which sorts an arr[] in ascending order using the bubble sort technique. There are 5 places in the code marked by ?1? , ?2? , ?3? , ?4? , ?5? which must be replaced by an expression or statement so the function works correctly.

```
void bubblesort( )
{
int i, j,k,temp;
for(i=0;i<?1?;i++)
{
for(j=0;j<?2?;j++)
{
if(arr[j]> ?3?)
{
temp=arr[j];
?4?=arr[j+1];
arr[j+1]= ?5?;
}
}
}
}
```

(i) What is the expression or statement at ?1?
(ii) What is the expression or statement at ?2?
(iii) What is the expression or statement at ?3?
(iv) What is the expression or statement at ?4?
(v) What is the expression or statement at ?5?

Question 4

Write a Java program to generate Fibonacci series

0 1 1 2 3 5........ n terms   [5]

Question 5

Write a Java program to print the following pattern: [5]

5 4 3 2 1

4 3 2 1

3 2 1

2 1

1

Question 6

Write a Java program to do the following conversions **as per user's choice.**

1. Binary to Decimal   [10]

2. Decimal to Octal

3. Exit

Question 7

A class **Process** has been defined to count vowels and consonants. The details of the class are given below:

Class Name: Process

Data members/instance variables:

st : string to store a sentence

newSt : string to store the changed sentence.

cv : integer to store no of vowels.

cc : integer to store no of consonants.

Member functions:

Process( ): default constructor

Process(String ns): parameterised constructor to assign **st = ns**

void changeCase(): converts the sentence in **st** into lowercase and store in **newSt**

void countLetters( ): to count and print no of vowels and no of consonants in each word of the string **newSt**

Specify the class Process, giving details of the **constructors**, functions **void changeCase()** and **void countLetters( )**. Also write main function to create the object and invoke the methods to enable the task.

Question 8

*A number is said to be **sumproduct** number if the sum of its digits multiplied by product of its digits is equal to the original number*

Example: input: $144 = (1+4+4)*(1*4*4) = 9*16 = 144$, so 144 is a **sumproduct number**

Design a class **sum_product** with the following details:

Class Name: sum_product

Data members/instance variables:

N : integer to store a number.

Member functions:

sum_product ( ) : constructor to initilalize data members with initial values.

void readNum( ) : to accept value of data member N from the input.

int Sum(int v) : returns sum of all the digits of the number v

int Product(int v) : returns product of all the digits of the number v

void Check( ) : decide and print whether the number N is a sum product number or not by invoking functions Sum(int) and Product(int).

Specify the class **sum_product**, giving details of the **constructor, void readNum( )**, **int Sum( ), int Product( ), void Check( )**. Also write main function to create the object and invoke the methods to enable the task.