Unique Paper Code	**:**	**32341201_OC**
Name/Title of the paper	**:**	**Programming in Java-OC**
Name of the Course	**:**	**B. Sc. (H) Computer Science**
Semester	**:**	**II**
Year of Admission	**:**	**2015, 2016, 2017, 2018**
Duration of Examination	**:**	**3 Hours**
Maximum Marks	**:**	**75**

Instructions for Candidates

1. Attempt any FOUR out of SIX questions.
2. All questions carry equal marks.
3. All parts of a question must be answered together.
4. The data types of variables/data members/arrays and return types of the methods should be clearly stated.

Q1. Assuming all necessary packages imported (where required) in the following Java code snippets, write the output and **explain your answer**.

i)
```
public class ArrQ {
    int v1;
    int v2;
    public void meth1() {
        v1 = 0;
        v2 = 0;
        int[] v3 = { 0 };
        meth2(v2, v3);
        System.out.println(v1+" "+v2+" "+v3[0]+" ");
    }
    public void meth2(int v2, int[] v3) {
        v1 = 1;
        v2 = 1;
        v3[0] = 1;
    }
    public static void main(String[] args) {
        ArrQ aq = new ArrQ();
        aq.meth1();
    }
}
```

ii)
```
public class ExcepHand {
    public static void main(String[] args) {
        try {
            meth1();
        } catch (InterruptedException ie) {
            System.out.println("A");
            throw new RuntimeException();
        } catch (RuntimeException ie) {
            System.out.println("B");
            return;
        } catch (Exception ie) {
            System.out.println("C");
        } finally {
            System.out.println("D");
        }
        System.out.println("E");
    }
    static void meth1() throws InterruptedException {
        throw new InterruptedException("Demo");
    }
}
```

iii)
```
public class A {
    public static void main(String[] args) {
        double d=0x27.2p2;
        int i=(int)d;
        d=d%0b1010;
        System.out.println("Value of d is " + d);
        System.out.println("Value of i is " + i);
    }
}
```

iv)
```
public class StaticClass {
    static int v1 = 3;
    static int v2;
    static void methStatic (int x) {
        System.out.println("x : " + x);
        System.out.println("v1 : " + v1);
        System.out.println("v2 : " + v2);
    }
    static {
        System.out.println("Static block");
        v2 = v1 + 5;
    }
    public static void main(String args[]) {
        methStatic(11);
    }
}
public class StaticTest {
    static int v1 = 31;
    static int v2 = 28;
    static void methStatic () {
        System.out.println("v1 : " + v1);
    }
    public static void main(String args[]) {
        StaticTest.methStatic();
        StaticClass.methStatic(42);
        System.out.println("v2 : " + v2);
        System.out.println("StCls.v2:" + StaticClass.v2);
    }
}
```

v)
```
public class B {
    public static void main(String args[]) {
        int iarr[][] = {{5, 7}, {6, 8}};
        int a, b;
        for (a = 1; a > -1; a--) {
            for (b = 1; b > -1; b--) {
                System.out.print(iarr[b][a]);
            }
        }
    }
}
```

Q2. Consider the following table:

Number of units consumed	Rate
1-100	Rs 500/- rental charges only
101-200	Rs 1.00 per unit + rental charges of Rs 500
201-300	Rs 1.20 per unit + rental charges of Rs 500
Above 300	Rs 1.50 per unit + rental charges of Rs 500

Write a program in Java that does the following:

- Defines a class **`ElectricityBill`** having five private instance variables storing consumer details: **`consumerNo`**, **`consumerName`**, **`consumerAge`**, **`consumerAddress`**, **`numUnitsConsumed`**; a private class variable **`count`** (that keeps the count of total number of instances), all having appropriate data types.
- Defines a parameterized constructor; and three methods- **`display()`** for displaying consumer details; **`calculate()`** for computing the monthly bill according to the units consumed as per the following table and display the total amount to be paid and **`displayCount()`** to display the total number of consumers (instances of the class).
- The program should be able to raise an exception `NegativeAgeException` if the age entered by the user is negative. The exception should be handled by displaying a message "`Error: Age cannot be negative!`" on the screen and the program should end.
- Defines a driver class **`Demo`** having `main()` method with appropriate code to show working of the above classes.

Q3. a. Assuming all necessary packages imported in the following Java code, identify the errors and rewrite the rectified code. **Explain your answer.**

```
public class VarInit {
    int v1, v2 = 0;
    static int v3;
    public static void main(String[] args) {
        int v4;
        int v5 = 0;
        v1++; v2++;
        v3++; v4++;
    }
}
```

b. Java implements a controlled version of global methods and global variables with the help of static methods and variables. Explain the statement.

c. What is multiple inheritance? Why does Java not support it? Explain the workaround with an example.

Q4. a. Write a multithreaded program in Java to take n integers from the user. Two threads are then created. The first thread prints even integers on the console and the second thread writes odd integers to a text file.

b. Using Java AWT, write a program that does the following:

- Creates a frame titled **"My_New_Frame"** having two fields to add `UserId` and `Password`. If the user types in correct user id and correct password, display a message `"Successful"` inside the frame otherwise display `"Invalid Credentials"`.
- Using appropriate adapter class to display the message `"Typed character is: <typedCharacter>"` in the frame window when user types any key.

Q5. Write a program in Java that accepts words through command line and works as follows:

- If the number of arguments is equal to five, it should sort them in alphabetical order and print it in a file named **`file1.txt`**.
- If the number of arguments is equal to zero, then the program should ask the user to enter a sentence of five words, sort the words in alphabetical order and print it on console.
- If the number of arguments is neither five nor zero, then the exception raised should be handled by the program and a message **"Error: Number of arguments is not valid!"** is displayed on the screen and the program ends.

Q6. a) Consider the following incomplete Java code snippet.

```
int index = 10;
for(int x = 2; x <= index; x++) {
   ...
}
```

Write Java statements inside the above `for` loop to generate the formatted output as mentioned below.

```
 2    4    6    8   10
 4    8   12   16   20
 6   12   18   24   30
 8   16   24   32   40
10   20   30   40   50
```

b) Write Java statements/prototype for the following tasks:

i) a method that accepts a character, an array of integers and has void as a return type.

ii) a while loop that reads some words from the keyboard till `^z` is entered and displays each word per row.

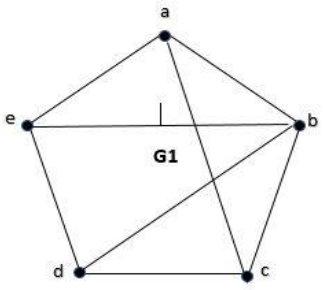
iii) A single statement that compares values of two numbers stored in variables **`u`** and **`v`** and stores incremented value of the greater number in the variable **`w`** by making use of unary increment operator and ternary operator.

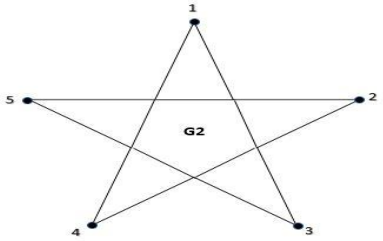
Unique Paper Code	: **32341202-OC**
Name of the Course	: B.Sc. (H) Computer Science (Old Course)
Name of the Paper	: Discrete Structures
Semester	: II
Duration	: 3 hrs
Maximum Marks	: 75
Admission Year	: **2015-18**

Instructions for Candidates

1. All questions carry equal marks.
2. Attempt any FOUR out of six questions.

Q1. For the following graphs G1 and G2, determine whether G1 and G2 are isomorphic? Justify. Find the incidence matrix for the given graphs G1 and G2. Determine whether G1 and G2 are planar. If yes, redraw else, give reasons. Find out if there exists any Euler Path or Euler Circuit for the graphs G1 and G2. If it exists, write sequence of vertices for each of them. Tell whether it is possible to draw a tree for each graph G1 and G2 by removing an edge? Justify your answer.





Q2. Use Master method to find asymptotic bounds for the following recurrence relation:

$$T(n) = 2T\left(\frac{n}{4}\right) + \sqrt{n}$$

Among 50 players, 26 got medals in first tournament and 21 got medal in second tournament for various categories. If 17 players did not get a medal in either tournament, how many players got a medal in both the tournaments?

If the number of players who got a medal in first tournament is equal to that in second tournament, if the total number of players who got medal in exactly one tournament is 40, and if 4 players did not get a medal in either tournament, determine the number of players, who got a medal in the first tournament only, who got a medal in the second tournament only, and who got a medal in both the tournaments.

Q3. Show all the steps of Insertion Sort to put the following list of items in an increasing order

5	2	7	4	9	3	6	1	8

Given that the number of comparison in insertion sort is n (n – 1) / 2. Prove that it is $\Theta(n^2)$. Also find suitable values of C1, C2 and K.

Q4. Given a relation R on set A= {1, 2, 3, 5, 6, 10, 15, 30} such that

R = {(a, b): a is divisor of b and a ϵ A, b ϵ A}

Show that it is a POSET. Draw its digraph and Hasse Diagram. Compute Maximal and Minimal element of Hasse Diagram.

Assume f(x) = x+3, g(x) = x-3 and h(x) = 4x, x ϵ R. Find the composition

(i) g o f (ii) h o f and (iii) f o h o g.

Q5. Find the total solution (homogenous and particular solution) of the given recurrence relation:

$$a_r - 4a_{r-1} + 4a_{r-2} = 3r + 2^r$$

with $a_2 = 12$, $a_3 = 20$

Q6. Convert the following statement in symbolic form and show that it is a valid conclusion:

"If you send me the URL, then I will finish configuring the software. If you do not send me the URL, then I will go for a walk and If I go for a walk, then I will keep my blood pressure in control leads to the conclusion If I do not configure the software, then I will keep my blood pressure in control."

Find inverse, converse and contra-positive for the statement

"If you send me the URL, then I will finish configuring the software."

Consider the word "CLIMATE". Calculate in how many ways these letters can be arranged. Calculate in how many ways the letters can be arranged such that the vowels occur in odd places.

Unique Paper Code : 32341402_OC
Name of Paper : Software Engineering
Name of Course : BSc. (H) Computer Science (CBCS)
Semester : IV (Admissions of 2015, 2016, 2017 & 2018)

Duration: 3 hours Maximum marks: 75

Note: Attempt any four questions. All questions carry equal marks.

Q.1 Suppose that you need to develop a Software. The members in the team have an average experience on similar projects and the technology is relatively new. The requirements may change anytime and are complex and unclear. Also, the software releases are frequent. Which SDLC model will you prefer in this case? Support your answer with appropriate reasons. Explain all phases of the model chosen with suitable diagram.
What are the factors to be considered while selecting an appropriate Process Model?

Q.2 Create a data flow diagram (level 0 and level 1) of the problem statement given below:
A COVID vaccination registration process is to be created. The eligible individuals (age greater than 45) can register online for the vaccination by providing the required details (name, age, gender, region, AADHAR number as well as the preferred date). The process validates the details provided by the individual. If the date chosen is available and the stock of vaccine is not depleted, it confirms the date, time and the Centre for vaccination to the individual.
Also create and explain the data dictionary for the above problem statement.

Q.3 Which of the following requirements in Software Requirement Specification (SRS) document are ambiguous? Justify your answer.

(a) The system shall be user friendly.
(b) The system shall have 256KB of RAM.
(c) The system shall be menu driven.
(d) The system shall be manageable.
(e) The system shall be reliable and of high quality.

Explain various stages of COCOMO-II Model. Consider a database application project with the following characteristics:

(a) The application has 10 screens with 5 views each and 8 data tables for 2 servers and 8 clients.
(b) The application may generate two reports of 6 sections each from 07 data tables for two server and 3 clients. There is 10% reuse of object points.

The developer's experience and capability in the similar environment is low. The maturity of organization in terms of capability is also low. Calculate the object point count, new object points and effort to develop such a project.

Q.4 Investor A, Investor B and Investor C are offering different investment plans.

A is subject to a disrupting event with probability 0.01 with related loss of Rs 800.
B is subject to a disrupting event with probability 0.02 with related loss of Rs 700.
C is subject to a disrupting event with probability 0.03 with related loss of Rs 400.

Considering the risk involved, which one of the three investors will you prefer and why?
What are the ways to deal with risks? Explain in detail.

Q.5 Consider the program given below for calculating the factorial of a number. It consists of main() program and the module fact(). Draw the control flow graph of the program. Compute the Cyclomatic Complexity for both main() and fact() independently. Also compute the Cyclomatic complexity of the complete program and find all independent paths.

```
main(){
        int n;
        int fact(int);
            1. clrscr();
            2. cout<< "Enter the number-";
            3. cin>>n;
            4. if (n<0)
            5.      cout<<"NA";
            6. else
            7.      cout<<"Factorial is -"<<fact(n);
            8. }

int fact(int n)
  {
        int i;
            1. int p=1;
            2. for(i=1;i<=n;i++)
            3.      i=p×i;
            4. return(p);
            5. }
```

Q.6 Why cohesion should be high and coupling should be low in a software design? Justify and explain with appropriate examples?

Identify the type of cohesion involved in each of the following cases with suitable justifications.

1. X outputs some data that becomes an input for Y.
2. Instructions in a module accomplish different tasks yet they are combined in a module because there is a specific order in which the tasks should be completed.
3. There is no relationship between the tasks that are put in a module yet they are all put in a single module.
4. The instructions that are combined in a module fall in the same logical class of functions.
5. The instructions are put in one module because they all are executed in the same time span.

:Course **: B.Sc. (Hons) Computer Science IV sem (CBCS)**

Paper Name **: Database Management Systems**

Unique Paper code **: 32341403_OC**

Max Marks **: 75**

Time **: 3 hours**

Instructions:

1. Attempt any FOUR questions
2. All questions carry equal marks
3. The complete answer to a question MUST be uploaded in the form of a single PDF file.

Q1

The XYZ Co. deals with several pharmaceutical companies. Its data requirements include the following specifications:

- Patients are identified by SSN, and their names, addresses, and also age.
- Doctors are identified by SSN. For each doctor, the name, specialty and years of experience must be recorded.
- Each pharmaceutical company is identified by name and has a phone number.
- For each medicine, the trade name and formula must be recorded. Each medicine is sold by a given pharmaceutical company, and the trade name identifies a medicine uniquely from among the products of that company. If a pharmaceutical company is deleted, you need not keep track of its products any longer.
- Each pharmacy has a name, address, and phone number.
- Each pharmacy sells several drugs and has a price for each. A medicine could be sold at several pharmacies, and the price could vary from one pharmacy to another.
- Doctors prescribe medicine for patients. A doctor would prescribe one or more medicine for several patients, and a patient could obtain prescriptions from several doctors. Each prescription has a date and a quantity associated with it.

Draw an ER diagram that captures the above information. Clearly state any constraints that you assume. Also, extend the above ER diagram to EER using one specialization.

Q2

Consider the relations given below:

Doctor(SSN,Firstname,Lastname,Speciality,YearsOfExp,
PhoneNum)

Patient(SSN,Firstname,Lastname,Address,DOB,PrimaryDoc_SSN)

Medicine(TradeName,UnitPrice,GenericFlag)

Prescription(ID,Date,Doctor_SSN,Patient_SSN)

Prescription_Medicine(PrescriptionID,TradeName,Quantity)

where

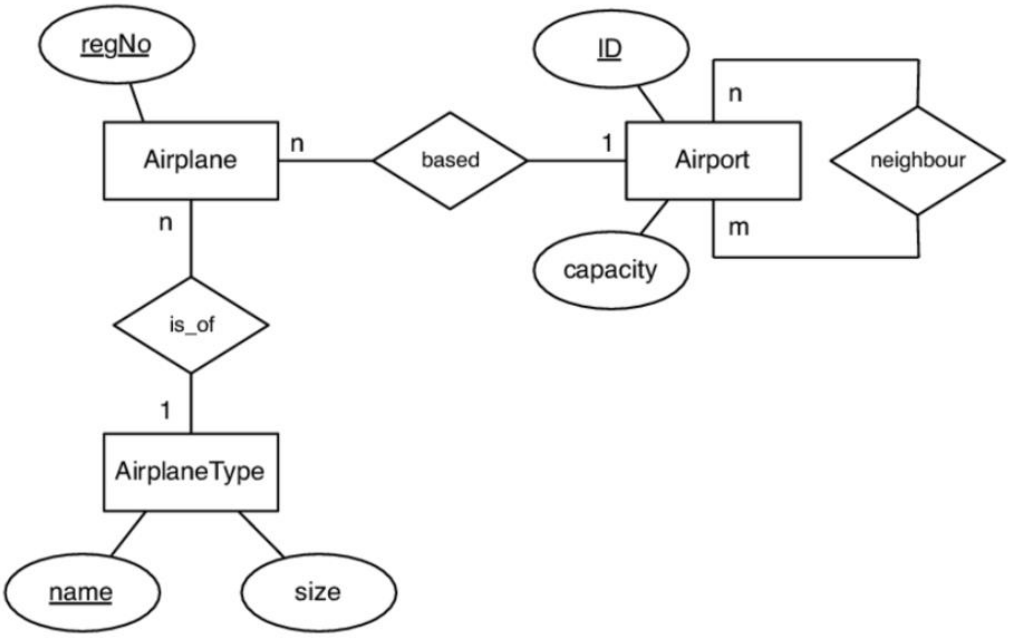
`Medicine.GenericFlag` represents whether or not the medicine is generic (True or False).
`Patient.PrimaryDoc_SSN` is a foreign key to **`Doctor.SSN`**
`PrescriptionID` of **`Prescription_Medicine`** relation is a foreign key to **`ID`** attribute of **`Prescription`** relation.
`Prescription_Medicine.TradeName` refers to **`Medicine.TradeName`**
`Precription.Doctor_SSN` and **`Prescription.Patient_SSN`** are foreign keys to **`Doctor.SSN`** and **`Patient.SSN`** respectively.

Write the following queries in SQL and Relational Algebra.

- List the **`TradeName`** of generic medicine with unit price less than Rs 150.
- List the names of patients whose primary doctor is **`'Rakesh Sharma'`**
- List the names of doctors who are not primary doctors to any patient
- For medicines written in more than 20 prescriptions, report the trade name and the total quantity prescribed.
- List the **`SSN`** of patients who have **`'Paracetamol'`** and **`'Vitamin'`** trade names in one prescription
- List the **`SSN`** of distinct patients who have **`'Paracetamol'`** prescribed to them by a doctor named **`'Rakesh Sharma'`**.
- List the first and last name of patients who have no prescriptions written by doctors other than their primary doctors.

Q 3

Map the following E-R Diagram to relational schema :



Now, write the **CREATE TABLE** command for all of the above tables in SQL ensuring that the following concepts are used at least once: integer, string, and date data, **NOT NULL** constraint, **CHECK** constraint, **PRIMARY KEY** constraint, **FOREIGN KEY** constraints (with **ON DELETE SET NULL** and **ON UPDATE CASCADE** constraints, if applicable).

Also, describe the role of recursive relationships in the context of the above diagram.

Q4

Given below are two sets of FDs for a relation **R(A,B,C,D,E)** :

F : A→ B, AB →C, D → AC, D→ E
G : A→ BC, D→ AE

Are F and G equivalent? Find the minimal cover for the set of dependencies F.

Now, Consider another relation **R = {A,B,C,D,E,F,G,H,I,J}** with the following set of FDs

F = { AB→C, A→DE, B→F, F→GH, D→IJ }

Find the key. Which highest normal form is this relation in? Why? Decompose it into 2NF and 3NF relations. Is this decomposition dependency preserving? Justify your answer.

Q5

A file comprising employee records has **emp_ID** as the primary key. It is searched with the help of B+ tree index with **order p = 3** for internal nodes and **order p_{leaf} = 2** for leaf nodes.

- If the values of **emp_ID** are inserted in the following order, show how the tree will expand and how many times the leaf node will split up.
  216, 182, 333, 115, 160, 235, 218, 332
- Show the tree after deleting the employees with **emp_ID** numbers 216, 182 and 333. Show each step.
- What will be the number of block accesses in the above indexing scheme?

Q6

How does DDL support the implementation of the three-schema architecture?

Consider the following two relations **R1** and **R2**:

R1		
P	**Q**	**S**
10	a	5
15	b	8
5	a	6

R2		
A	**B**	**C**
10	b	6
25	c	1
10	b	5

Show the result of the following relational queries:

- $R1 \bowtie_{R1.P=R2.A} R2$
- $R1 \ _{R1.Q=R2.B} \ R2$
- $R1 * R2$
- $R1 \bowtie_{(R1.P=R2.A \text{ AND } R1.R=R2.C)} R2$

Consider a relational schema comprising three relations as follows:

S represents Sailors(sid, name, rating, age)

B represents Boats (bid, name, color)

R represents Reserves (sid, bid, day, rname)

Draw a query tree to show a possible order of execution for the following relational expression:

$$\pi_{sid,sname,age}(\sigma_{age<30}(\sigma_{color='red'}(\sigma_{bid=bid}(B \times \sigma_{sid=sid}(S \times R)))))$$

:Course **: B.Sc. (Hons) Computer Science IV sem (CBCS)**

Paper Name **: Database Management Systems**

Unique Paper code **: 32341403_OC**

Max Marks **: 75**

Time **: 3 hours**

Instructions:

1. Attempt any FOUR questions
2. All questions carry equal marks
3. The complete answer to a question MUST be uploaded in the form of a single PDF file.

Q1

The XYZ Co. deals with several pharmaceutical companies. Its data requirements include the following specifications:

- Patients are identified by SSN, and their names, addresses, and also age.
- Doctors are identified by SSN. For each doctor, the name, specialty and years of experience must be recorded.
- Each pharmaceutical company is identified by name and has a phone number.
- For each medicine, the trade name and formula must be recorded. Each medicine is sold by a given pharmaceutical company, and the trade name identifies a medicine uniquely from among the products of that company. If a pharmaceutical company is deleted, you need not keep track of its products any longer.
- Each pharmacy has a name, address, and phone number.
- Each pharmacy sells several drugs and has a price for each. A medicine could be sold at several pharmacies, and the price could vary from one pharmacy to another.
- Doctors prescribe medicine for patients. A doctor would prescribe one or more medicine for several patients, and a patient could obtain prescriptions from several doctors. Each prescription has a date and a quantity associated with it.

Draw an ER diagram that captures the above information. Clearly state any constraints that you assume. Also, extend the above ER diagram to EER using one specialization.

Q2

Consider the relations given below:

Doctor(SSN,Firstname,Lastname,Speciality,YearsOfExp,
PhoneNum)

Patient(SSN,Firstname,Lastname,Address,DOB,PrimaryDoc_SSN)

Medicine(TradeName,UnitPrice,GenericFlag)

Prescription(ID,Date,Doctor_SSN,Patient_SSN)

Prescription_Medicine(PrescriptionID,TradeName,Quantity)

where

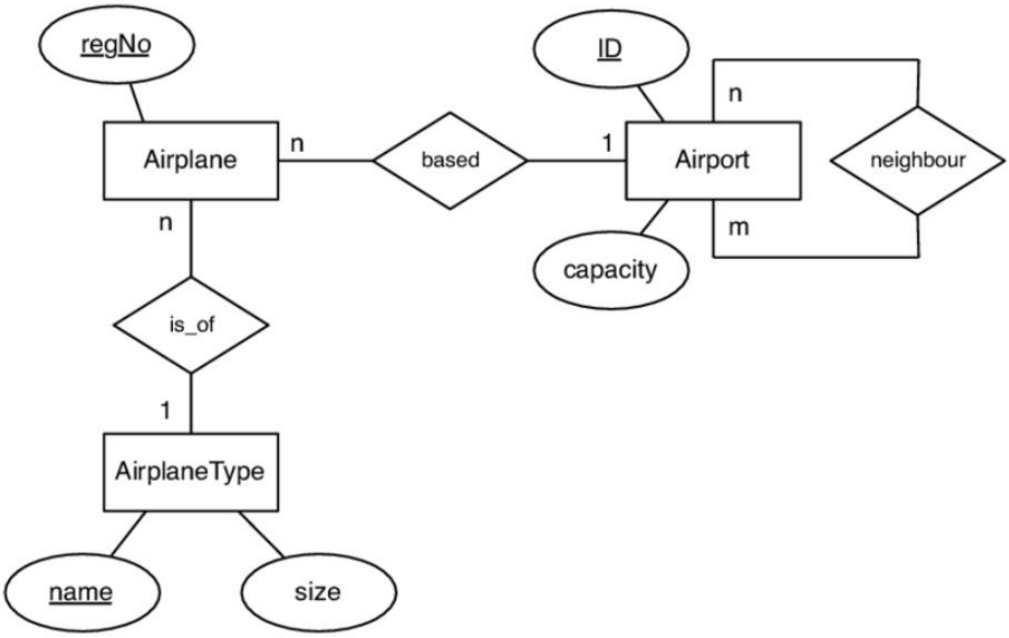
`Medicine.GenericFlag` represents whether or not the medicine is generic (True or False).
`Patient.PrimaryDoc_SSN` is a foreign key to **`Doctor.SSN`**
`PrescriptionID` of **`Prescription_Medicine`** relation is a foreign key to **`ID`** attribute of **`Prescription`** relation.
`Prescription_Medicine.TradeName` refers to **`Medicine.TradeName`**
`Precription.Doctor_SSN` and **`Prescription.Patient_SSN`** are foreign keys to **`Doctor.SSN`** and **`Patient.SSN`** respectively.

Write the following queries in SQL and Relational Algebra.

- List the **`TradeName`** of generic medicine with unit price less than Rs 150.
- List the names of patients whose primary doctor is **`'Rakesh Sharma'`**
- List the names of doctors who are not primary doctors to any patient
- For medicines written in more than 20 prescriptions, report the trade name and the total quantity prescribed.
- List the **`SSN`** of patients who have **`'Paracetamol'`** and **`'Vitamin'`** trade names in one prescription
- List the **`SSN`** of distinct patients who have **`'Paracetamol'`** prescribed to them by a doctor named **`'Rakesh Sharma'`**.
- List the first and last name of patients who have no prescriptions written by doctors other than their primary doctors.

Q 3

Map the following E-R Diagram to relational schema :



Now, write the **CREATE TABLE** command for all of the above tables in SQL ensuring that the following concepts are used at least once: integer, string, and date data, **NOT NULL** constraint, **CHECK** constraint, **PRIMARY KEY** constraint, **FOREIGN KEY** constraints (with **ON DELETE SET NULL** and **ON UPDATE CASCADE** constraints, if applicable).

Also, describe the role of recursive relationships in the context of the above diagram.

Q4

Given below are two sets of FDs for a relation **R(A,B,C,D,E)** :

F : A→ B, AB →C, D → AC, D→ E
G : A→ BC, D→ AE

Are F and G equivalent? Find the minimal cover for the set of dependencies F.

Now, Consider another relation **R = {A,B,C,D,E,F,G,H,I,J}** with the following set of FDs

F = { AB→C, A→DE, B→F, F→GH, D→IJ }

Find the key. Which highest normal form is this relation in? Why? Decompose it into 2NF and 3NF relations. Is this decomposition dependency preserving? Justify your answer.

Q5

A file comprising employee records has **emp_ID** as the primary key. It is searched with the help of B+ tree index with **order p = 3** for internal nodes and **order p_{leaf} = 2** for leaf nodes.

- If the values of **emp_ID** are inserted in the following order, show how the tree will expand and how many times the leaf node will split up.
  216, 182, 333, 115, 160, 235, 218, 332
- Show the tree after deleting the employees with **emp_ID** numbers 216, 182 and 333. Show each step.
- What will be the number of block accesses in the above indexing scheme?

Q6

How does DDL support the implementation of the three-schema architecture?

Consider the following two relations **R1** and **R2**:

R1		
P	**Q**	**S**
10	a	5
15	b	8
5	a	6

R2		
A	**B**	**C**
10	b	6
25	c	1
10	b	5

Show the result of the following relational queries:

- $R1 \bowtie_{R1.P=R2.A} R2$
- $R1 \ _{R1.Q=R2.B} \ R2$
- $R1 * R2$
- $R1 \bowtie_{(R1.P=R2.A \text{ AND } R1.R=R2.C)} R2$

Consider a relational schema comprising three relations as follows:

S represents Sailors(sid, name, rating, age)

B represents Boats (bid, name, color)

R represents Reserves (sid, bid, day, rname)

Draw a query tree to show a possible order of execution for the following relational expression:

$$\pi_{sid,sname,age}(\sigma_{age<30}(\sigma_{color='red'}(\sigma_{bid=bid}(B \times \sigma_{sid=sid}(S \times R)))))$$

Unique Paper Code : 32341401
Name of the Course : B. Sc. (Hons.) Computer Science – CBCS (old course)
Name of the Paper : Design and Analysis of Algorithms
Semester : IV
Year of admission : 2015,2016,2017 and 2018
Duration : 3 Hours
Maximum Marks : 75

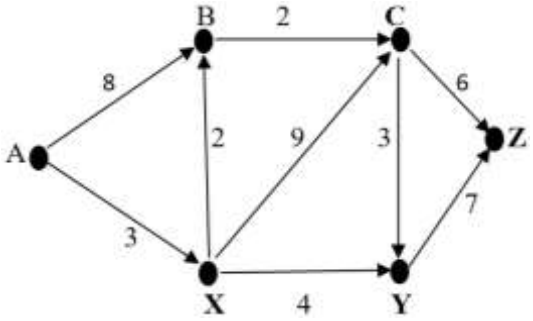
Instructions for Candidates:
Attempt Any Four questions. All Questions carry equal marks.

1. A student named Rohan wishes to enhance his knowledge by studying a few online courses. Every course has a fee that one has to pay to register. Also, each course gives some credit on its successful completion. He has some amount of money saved with him. He needs to choose among the available courses such that he gets maximum sum of credits by spending the money he has. Write an algorithm to find the optimal solution for Rohan's problem.
   Using the algorithm given by you, find the courses he should study for the given instance, illustrating each step clearly.

   Rohan has **$70**.

S. No.	Course Name	Fee (in $)	Credit
1.	C1	40	12
2.	C2	20	8
3.	C3	30	16
4.	C4	10	9
5.	C5	30	5

2. A person named **Albert (denoted by A)** starts a food delivery service. The people who wish to avail this service register themselves with him by providing their address. He hires delivery boys to deliver food and assigns a different delivery boy to each registered person. To save time, he asks the delivery boys to use Scooters to deliver the food. The following diagram shows the time that a delivery boy takes to reach from one place to another. Consider that **B, C, X, Y** and **Z** are the registered people. The number on each edge represents the time (in minutes). Compute the **minimum** time to reach them all individually.



   Now, suppose all Scooters need to be serviced and are unavailable. The delivery boys need to use bicycles to reach the registered people. The amount of time taken to reach the destination using a bicycle is the square of the time taken to reach the destination using a

Scooter. Will the delivery boys be reaching the respective destination using same route as computed above? Does this imply all such routes will never change in any such problem instance where the new edge weights are square of original edge weights?

3. Suppose there are n bottles and each bottle i has some capacity c_i. Write the most efficient algorithm to arrange the bottles in the order of their capacities. Also, explain the running time of your algorithm.
   Next, consider that every bottle has an expiry date before which its content should be consumed. Each bottle is assigned a priority such that a higher value indicates a higher priority. The bottle having a closer expiry date has a higher priority assigned to it. Give an efficient algorithm to arrange the bottles in non-increasing order of their priorities. Does your algorithm involve any comparisons? If yes, count them. Explain the running time of your algorithm.

4. Consider a set of jobs to be scheduled on a processor. Each job has an execution time associated with it. A job-scheduler allocates the processor to one of the given jobs at a time. The scheduler has fixed a *maximum execution time*: the maximum duration for which a job can continue processing once scheduled. If the execution time of any job is greater than this value then it is pre-empted and scheduled again later with the remaining execution time.
   Consider the following variant of **shortest-job-first** scheduling algorithm which schedules the jobs in the ascending order of their execution times. Suppose the data structure used for this scheduling algorithm is a red-black tree (called as scheduling tree) where the jobs are the nodes in the tree.
   Algorithm:
   - The job having least execution time will be chosen and sent for execution and is removed from the tree.
   - If the job reaches its *maximum execution time* while being processed, it is pre-empted and needs to be scheduled later to complete its processing. This job is reinserted into the scheduling tree based on its remaining execution time.
   - Again, the job with the least execution time is selected, repeating the above steps until all the jobs are processed completely.

   Consider a set of jobs whose execution times (in nanoseconds) are as follows: **4,10,7,23,5,30**. Construct the red-black tree corresponding to the given input and then schedule the jobs using the above stated algorithm thereby showing the red-black tree after every step. Assume **the maximum execution time is 20 nanoseconds**.

5. A party is going on in a hotel. When the dinner starts, a waiter is assigned the task of distributing plates to the guests. He creates a pile of plates on a table by adding one plate at a time. The waiter can pick up one or more plates at a time from the pile to distribute. The waiter may add more plates to the pile one by one at any time. Suppose he performs a total of n operations wherein an operation can be putting one plate onto the pile or removing one or more plates from the pile. Analyse the average cost per operation over a sequence of n operations.

Later, after the dinner gets over, a game is played to find out the most social person in the party. Suppose there are ***m*** guests in the party. Each guest considers a set of guests as his friends and gives a flower to each of his friends. The guest who receives the maximum number of flowers wins the game. Suggest an efficient divide-and-conquer algorithm, having least possible worst-case running time, to find a winner. Also, find all the winners, if more than one winner exists. Explain the running of the algorithm given by you.

6. A chemical laboratory has ***n*** chemicals stored in it. There is a risk that some chemicals may react with some others. For safety purpose, the lab assistant decides that for each pair of reactive chemicals, one is kept in a yellow-coloured bottle and the other is kept in a green-coloured bottle. Give an efficient algorithm that he can use to find out whether such a colouring is possible or not. If yes, the algorithm should determine the bottle colour for each of the ***n*** chemicals. If not, the algorithm should report it. Give an instance having at least ***6*** chemicals in which there are a minimum of ***7*** reactive pairs for which such a colouring is possible.

Unique Paper Code : 32341401
Name of the Course : B. Sc. (Hons.) Computer Science – CBCS (old course)
Name of the Paper : Design and Analysis of Algorithms
Semester : IV
Year of admission : 2015,2016,2017 and 2018
Duration : 3 Hours
Maximum Marks : 75

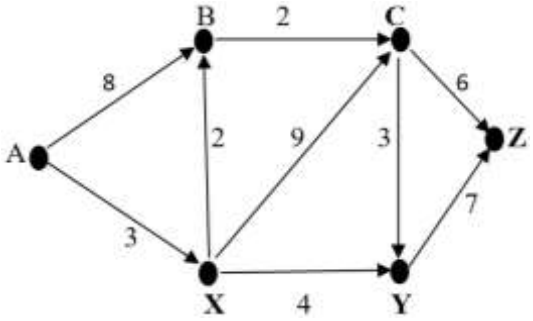
Instructions for Candidates:
Attempt Any Four questions. All Questions carry equal marks.

1. A student named Rohan wishes to enhance his knowledge by studying a few online courses. Every course has a fee that one has to pay to register. Also, each course gives some credit on its successful completion. He has some amount of money saved with him. He needs to choose among the available courses such that he gets maximum sum of credits by spending the money he has. Write an algorithm to find the optimal solution for Rohan's problem.
   Using the algorithm given by you, find the courses he should study for the given instance, illustrating each step clearly.

   Rohan has **$70**.

S. No.	Course Name	Fee (in $)	Credit
1.	C1	40	12
2.	C2	20	8
3.	C3	30	16
4.	C4	10	9
5.	C5	30	5

2. A person named **Albert (denoted by A)** starts a food delivery service. The people who wish to avail this service register themselves with him by providing their address. He hires delivery boys to deliver food and assigns a different delivery boy to each registered person. To save time, he asks the delivery boys to use Scooters to deliver the food. The following diagram shows the time that a delivery boy takes to reach from one place to another. Consider that **B, C, X, Y** and **Z** are the registered people. The number on each edge represents the time (in minutes). Compute the **minimum** time to reach them all individually.



   Now, suppose all Scooters need to be serviced and are unavailable. The delivery boys need to use bicycles to reach the registered people. The amount of time taken to reach the destination using a bicycle is the square of the time taken to reach the destination using a

Scooter. Will the delivery boys be reaching the respective destination using same route as computed above? Does this imply all such routes will never change in any such problem instance where the new edge weights are square of original edge weights?

3. Suppose there are n bottles and each bottle i has some capacity c_i. Write the most efficient algorithm to arrange the bottles in the order of their capacities. Also, explain the running time of your algorithm.
   Next, consider that every bottle has an expiry date before which its content should be consumed. Each bottle is assigned a priority such that a higher value indicates a higher priority. The bottle having a closer expiry date has a higher priority assigned to it. Give an efficient algorithm to arrange the bottles in non-increasing order of their priorities. Does your algorithm involve any comparisons? If yes, count them. Explain the running time of your algorithm.

4. Consider a set of jobs to be scheduled on a processor. Each job has an execution time associated with it. A job-scheduler allocates the processor to one of the given jobs at a time. The scheduler has fixed a *maximum execution time*: the maximum duration for which a job can continue processing once scheduled. If the execution time of any job is greater than this value then it is pre-empted and scheduled again later with the remaining execution time.
   Consider the following variant of **shortest-job-first** scheduling algorithm which schedules the jobs in the ascending order of their execution times. Suppose the data structure used for this scheduling algorithm is a red-black tree (called as scheduling tree) where the jobs are the nodes in the tree.
   Algorithm:
   - The job having least execution time will be chosen and sent for execution and is removed from the tree.
   - If the job reaches its *maximum execution time* while being processed, it is pre-empted and needs to be scheduled later to complete its processing. This job is reinserted into the scheduling tree based on its remaining execution time.
   - Again, the job with the least execution time is selected, repeating the above steps until all the jobs are processed completely.

   Consider a set of jobs whose execution times (in nanoseconds) are as follows: **4,10,7,23,5,30**. Construct the red-black tree corresponding to the given input and then schedule the jobs using the above stated algorithm thereby showing the red-black tree after every step. Assume **the maximum execution time is 20 nanoseconds**.

5. A party is going on in a hotel. When the dinner starts, a waiter is assigned the task of distributing plates to the guests. He creates a pile of plates on a table by adding one plate at a time. The waiter can pick up one or more plates at a time from the pile to distribute. The waiter may add more plates to the pile one by one at any time. Suppose he performs a total of n operations wherein an operation can be putting one plate onto the pile or removing one or more plates from the pile. Analyse the average cost per operation over a sequence of n operations.

Later, after the dinner gets over, a game is played to find out the most social person in the party. Suppose there are ***m*** guests in the party. Each guest considers a set of guests as his friends and gives a flower to each of his friends. The guest who receives the maximum number of flowers wins the game. Suggest an efficient divide-and-conquer algorithm, having least possible worst-case running time, to find a winner. Also, find all the winners, if more than one winner exists. Explain the running of the algorithm given by you.

6. A chemical laboratory has ***n*** chemicals stored in it. There is a risk that some chemicals may react with some others. For safety purpose, the lab assistant decides that for each pair of reactive chemicals, one is kept in a yellow-coloured bottle and the other is kept in a green-coloured bottle. Give an efficient algorithm that he can use to find out whether such a colouring is possible or not. If yes, the algorithm should determine the bottle colour for each of the ***n*** chemicals. If not, the algorithm should report it. Give an instance having at least ***6*** chemicals in which there are a minimum of ***7*** reactive pairs for which such a colouring is possible.

Unique Paper Code	:	**32341601**
Name of the Paper	:	**Artificial Intelligence**
Name of the Course	:	**B.Sc. (H) Computer Science**
Semester	:	**VI**
Duration of Examination	:	**Three Hours**
Maximum Marks	:	**75**

(For students admitted in 2015, 2016, 2017 & 2018)

Instructions for Candidates:

1. Attempt any **FOUR** questions.
2. Each question carries equal marks.

1. Give the Performance Measure, Environment, Actuators, and Sensors (PEAS) description for the *Automated Taxi Driver* environment. Differentiate between the following:

   - Fully observable vs. partially observable
   - Deterministic vs. stochastic
   - Episodic vs. sequential
   - Static vs. dynamic
   - Model-based agent and Goal-based agent
   - Goal-based agent and Utility-based agent

2. What are the differences between Recursive Transition Network (RTN) and Augmented Transition Network (ATN)? Draw the RTN to implement the grammar given below. Show the derivation of the sentence "**Mary slept on the sofa**" and also develop a parse tree using the following grammar:

S	→	NP VP
NP	→	N | DET N
VP	→	V | V PP
PP	→	PREP NP
N	→	Mary | sofa
V	→	slept
DET	→	the
PREP	→	on

3. Using the constraint satisfaction algorithm, solve the following cryptarithmetic problem:

$$\begin{array}{r} \quad B\ A\ S\ E \\ +\ B\ A\ L\ L \\ \hline G\ A\ M\ E\ S \\ \hline \end{array}$$

   Based on the solution of the above cryptarithmetic problem, find the value of B+L+A+M+E. Write a PROLOG program to implement GCD of two numbers.

4. Consider the following axioms:

   A1: Rajesh likes all kind of food.
   A2: Banana and Orange are food.
   A3: Anything anyone eats and not killed is food.
   A4: Madhav eats cashews and is still alive.
   A5: Anyone who is killed, is not alive.
   A6: Pankaj eats everything Madhav eats.

   Express the above axioms into First Order Predicate Logic (FOPL) statements and convert them into clausal form. Using resolution principle, prove that the statement "Rajesh likes cashews" is true.

   Transform the sentence $(\neg A \ \&\ B)\ V\ (A\ \&\ \neg B)\ \&\ C$ into Conjunctive Normal Form.

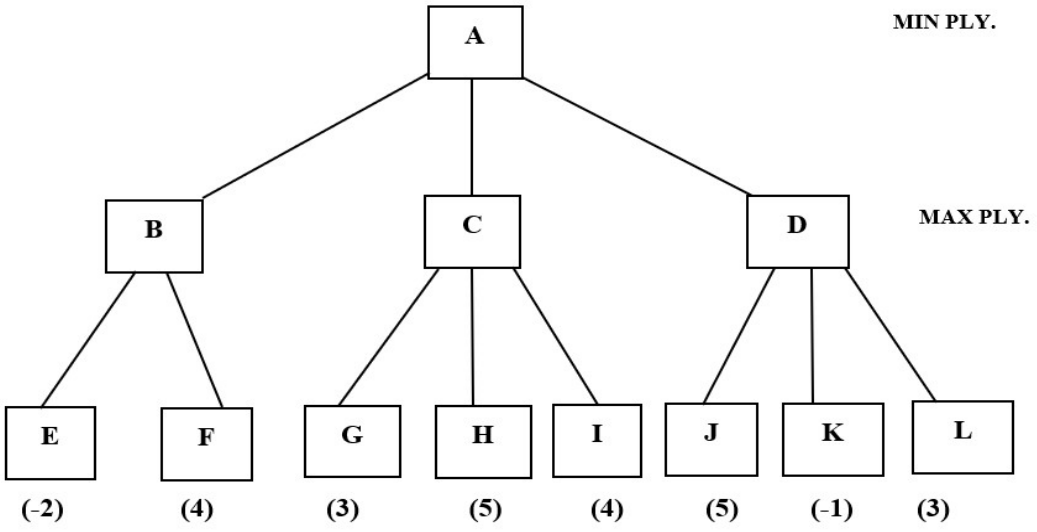
5. Differentiate between the monotonic reasoning and nonmonotonic reasoning. Give one example each of the monotonic and nonmonotonic reasoning.

   From experiments, it has been determined that $P(B|A) = 0.84$, $P(A) = 0.2$, and $P(B) = 0.34$. Find the probability $P(A|B)$ of the event A when it is known that some event B has already occurred. Describe how will you compute $P(A|\sim B)$ given only $P(A)$, $P(B|A)$, and $P(B)$?

   Draw the bayesian belief network for the given joint probability:
   $P(x_1, x_2, \ldots, x_7) = P(x_7|\, x_5, x_6)\, P(x_6|\, x_3, x_4)\, P(x_5|\, x_4)\, P(x_4|\, x_2)\, P(x_3|\, x_2)\, P(x_2|\, x_1)\, P(x_1)$

6. Give the similarities and differences between Best First Search and A* algorithm. Under what conditions A* algorithm provide an optimal solution?

   Consider the following game tree with ply depth 2 where the indicated scores are from the MIN player's point of view. Which move A should choose and why? Which nodes will be pruned according to the α-β pruning procedure? Give justifications of each.



Name of the Course : **B.Sc. (Hons.) Computer Science**

Semester : **VI**

Name of the paper : **Data Mining**

Unique Paper Code : **32347611**

Year of Admission : **2015, 2016, 2017 & 2018**

Duration: 3 Hours **Maximum Marks: 75**

Instructions for Candidates

1. Attempt any FOUR out of SIX questions.
2. All questions carry *equal* marks.
3. Upload single PDF file for each question.

1. Consider a sample dataset of patients visiting a clinic for consultation:

Patient ID	Patient Name	Blood Pressure	Blood Pressure date	Chest Pain	Age	Exercise	Heart Condition
101	Sarita	120	14-10-1995	1	20	High	Good
102	Maddy	110	16-1-2018	0	40	High	Good
103	Rohit	140	18-10-2018	3	?	Low	Bad
104	Gauhar	172	4-6-2018	3	39	Medium	Bad
105	Himani	150	8-6-2018	2	35	Low	Bad
106	Shubham	110	4-7-2018	1	40	Medium	Good
107	Suresh	120	5-3-2018	0	26	High	Good
108	Anmol	110	5-5-2018	1	27	Medium	Good

- Identify the type of each attribute and give justification.
- Perform min-max normalisation on "Blood Pressure" attribute.
- Identify the data quality issues for each of the following fields. Can these issues be resolved? If yes, how?
    - Blood Pressure date for patient 101.
    - The blood pressure meter is miscalibrated and adds 1 mmHg to each reading.
    - Age of the patient 103.

2. A binary classification problem with class labels: 'Yes' and 'No' that denotes the access to the elevator, has the following set of attributes and attribute values:

   Status = {Faculty, Student}
   Floor = {First, Second, Third, Fourth, Fifth}
   Health = {healthy, unhealthy}

   Consider the following set of records for the above classification problem:

Transaction Number	**Status**	**Floor**	**Health**	**Accessible**
1	Faculty	First	Healthy	Yes
2	Student	First	Healthy	No
3	Student	Third	Healthy	No
4	Faculty	Second	Unhealthy	Yes
5	Student	Fifth	Healthy	Yes
6	Faculty	First	Healthy	No
7	Student	Fifth	Unhealthy	No

   A rule-based classifier produces the following rule set:

   R1: Status = Faculty, Floor = Second → Accessible = Yes
   R2: Status = Student, Floor = Second → Accessible = No
   R3: Floor = First → Accessible = No
   R4: Health = unhealthy → Accessible = Yes
   R5: Status = Student, Floor = Fifth, Health = healthy → Accessible = Yes

   - Are the rules in the above rule set mutually exclusive? Justify.
   - Is the rule set exhaustive? Justify.
   - Is ordering needed for this set of rules? Justify
   - Do you need a default class for the rule set? Justify
   - Compute the coverage and accuracy of rules R1 and R5. Which one do you think is a better rule? Why?

3. Consider the training examples shown in the following table for a classification problem.

Student ID	Admission Category	Admission List	Gender	Predicted Class	Actual Class
1	Sports	First	M	C0	C0
2	Arts	Second	F	C0	C1
3	Arts	Third	F	C0	C0
4	Sports	Fourth	M	C0	C1
5	Academics	First	F	C0	C0
6	Arts	Second	F	C1	C1
7	Arts	Third	M	C1	C1
8	Sports	Fourth	M	C1	C0
9	Sports	Third	F	C1	C1
10	Arts	First	F	C1	C0
11	Sports	Third	M	C1	C1
12	Sports	Second	F	C1	C1
13	Sports	First	M	C1	C0

- Compute the Information Gain for the Student ID attribute.
- Compute the Gini Index for the Admission Category Attribute and Admission List attribute
- Which is a better attribute for split based on the Gini Index: Admission Category or Admission List? Why?
- Create a confusion matrix for the above data set and compute False positive rate, accuracy, recall and precision.

4. Consider the following set of points:

{44, 28, 48, 26, 32, 14, 52, 50}

Assuming that k=2, and initial cluster centres for k-means clustering are 5 and 38, compute the sum of squared errors (SSE) and cluster assignment for each iteration.

5. Consider the dataset given below:

Age	Income	Employed	Credit-rating	Buys Car
young	high	yes	fair	yes
young	high	no	good	no
middle	high	no	fair	yes
old	medium	no	fair	yes
old	medium	no	fair	yes
old	low	yes	good	no
old	medium	no	good	no
middle	high	yes	fair	yes

Compute all class conditional and class prior probabilities. Use Naïve Bayes classifier to predict the class of the following tuple:

X = (age = young, income = medium, employed = yes, credit rating = good)

6. Consider the market basket transactions shown in the following table. Use Apriori algorithm to answer the questions that follow.

TID	Item bought
1	oregano, chocolate, milk, cheese, french fries
2	milk, french fries, cheese, ketchup
3	chocolate, cheese, oregano, ketchup
4	chocolate, cheese, french fries
5	french fries, cheese, oregano, chocolate
6	chocolate, ketchup
7	oregano, french fries, ketchup
8	oregano, french fries, chocolate
9	ketchup, oregano, milk
10	french fries, chocolate

- Assuming the minimum support threshold is fixed at 40%, list the set of frequent 1-itemsets (L_1) and with their respective supports.
- List the itemsets in the set of candidate 2-itemsets (C_2) and calculate their supports.
- Generate all association rules from the itemsets in L_2 and also compute the confidence of these rules.

Unique Paper Code :	32341602
Name of the Paper :	Computer Graphics
Name of the Course :	B.Sc. (H) Computer Sc.
Semester :	VI

Duration: 3 Hours Maximum Marks: 75 Marks

Attempt any four questions.
All questions carry equal marks.
The complete answer to a question MUST be included in a SINGLE file.

Q1)
What do you understand by the statement: **aspect ratio = ¾** for a video monitor?

Consider two raster systems with resolutions **640×480** and **1280×1024**. How many pixels could be accessed in one second in each of these systems by a display controller that refreshes the screen at a rate of **60** frames per second? For each system, give the access time per pixel. Which of the above systems has better resolution? Justify your answer.

Q2)
Consider the triangle **ABC** with the following coordinates **A[2 6 1], B[4 9 1], C[4 9 1]**. Also consider a pair of lines **L** and **M** defined as: **L: y=1/2*(x+5)** and **M: x-y=0.** Using homogeneous coordinates, reflect the triangle **ABC** w.r.t. the line **L** and find the new coordinates. Next, rotate the transformed triangle by 90 degrees about the point of intersection **Q** of the lines **L** and **M**.

Q3)
Differentiate between Gouraud shading and normal vector interpolation shading. What is specular reflection in normal vector interpolation shading? What is the value of specular reflection parameter n_s for (i) dull surfaces and (ii) perfect reflectors?

How many different colour combinations can be generated using halftone approximations on a two-level RGB system with a **3×3** pixel grid?

Q4)
Consider the rectangular window **ABCD** and triangle **XYZ** with the following coordinates: **A(4, 1), B(12, 1), C(12, 7), D(4, 7)** and **X(8, 3), Y(14, 4), Z(12, 6)**. Clip the given triangle **XYZ** against the above rectangular window **ABCD** using the Sutherland Hodgman algorithm.

Also, clip the original triangle **XYZ** against the given rectangular window **ABCD** using Cohen Sutherland line clipping algorithm. While scan- converting the coordinates of an ellipse, what condition is tested to switch from region 1 to region 2.

Q5)
Distinguish between *orthographi*c and *oblique* parallel projections. Consider a unit cube with centre as origin and position vectors as given below:

(-0.5,-0.5, 0.5), (0.5,-0.5, 0.5), (0.5, 0.5, 0.5), (-0.5, 0.5, 0.5), (-0.5,-0.5,-0.5), (0.5,-0.5,-0.5), (0.5, 0.5,-0.5), (-0.5, 0.5,-0.5).

Translate the cube **5** units both in **X** and **Y** directions. Then perform single-point perspective projection on to the **Z=0** plane from a centre of projection at **Zc=10**. Also, calculate the vanishing point.

Q6)
Give one advantage and one disadvantage of the Z-buffer algorithm for visual surface determination.

Consider the equation of the given plane as **4x + 6y + 2z + 1 = 0**. Using incremental calculations, find the Z value at next pixel location **(x + 1, y)** and at next scan line location **(x, y + 1)**.

Derive the Basis Matrix for Hermite curves. Also, obtain its blending functions. Find the equation of the Hermite curve that passes through the starting point **(0,1)** and endpoint **(4,2).**

SET-B

Unique Paper Code	**:**	**12295201_OC**
Name of the Paper	:	**SPATIAL INFORMATION TECHNOLOGY**
Name of the Course	:	B.A. (Hons.) CBCS, Generic Elective Paper
Semester	:	II
Duration	:	3 Hours
Maximum Marks	:	75 Marks

Instruction for Students

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any 4 questions. All questions carry equal marks.
3. Use of stencil is allowed for drawing outline of maps.
4. Answers may be written either in English or Hindi; but the same medium should be used throughout the paper.

छात्रोंकेलिएनिर्देश

1. प्रश्नपत्रमिलतेहीतुरंतअपनारोलनंबरसबसेऊपरलिखिए |
2. किन्हीभीचारप्रश्नोंकाउत्तरदे | सभीप्रश्नोंकेअंकसमानहै |
3. मानचित्रकीबाहरीरेखाखींचनेकेलिएस्टेंसिलकेप्रयोगकीअनुमतिहै |
4. इसप्रश्नपत्रकाउत्तरअंग्रेजीयाहिंदीकिसीएकभाषामेंदीजिए, लेकिनसभीप्रश्नोंकेउत्तरोंकामाध्यमएकहीहोनाचाहिए।

1. Discuss the components of Spatial Information Technology (SIT) in detail?

   स्थानिक सूचना प्रौद्योगिकी (SIT) के विभिन्न संघटकोंका विस्तृत वर्णन कीजिये।

2. Give in brief about the web data sources. Explain different data structures used in SIT.

   विभिन्न वेब आंकड़ा स्रोतों की संक्षिप्त जानकारी दीजिये।SIT में प्रयोग होने वाले विभिन्न आंकड़ा संरचनाओ को स्पष्ट कीजिये।

3. Discuss the techniques of data input and data analysis.

   आंकड़ा इनपुट और आंकड़ा विश्लेषण की तकनीको का वर्णन कीजिये।

4. Discuss the functions of spatial information system in detail.

   स्थानिक सूचना तंत्र के प्रकार्यों की विस्तृत व्याख्या करें।

5. Discuss the various application areas of spatial information technology.
   स्थानिक सूचना प्रौद्योगिकी की प्रायोगिकता के विभिन्न क्षेत्रो का वर्णन कीजिये ।

6. Discuss data interpolation techniques.
   आंकड़ा इंटरपोलेशनतकनीकोंपरचर्चाकरें।

Unique paper Code : 32345201_OC

Name of the Course : B.Sc.(H) Computer Science

Name of the Paper : Introduction to Database Systems (Generic Elective - II)

Semester : II

Year of Admission : 2015, 2016, 2017 & 2018

Duration: Three hours Maximum Marks: 75

Instructions for candidates:

Attempt any four questions.

All questions carry equal marks.

*The complete answer to a question must appear in a single **PDF** file.*

You may make suitable assumptions in a question and state them clearly.

Q1. Illustrate the following with the help of an example in context to relational data model:

- Relation schema
- Attribute
- Tuple
- Degree of a relation
- Cardinality of a relation

Give one advantage and one disadvantage of the relational model as compared to traditional file systems.

Illustrate the concept of a weak entity, its partial key and its identifying relationship using a suitable example.

Consider the following relations **R1** and **R2** having the same schema:

R1

Id	Name
1008	Anisha
1012	Suman
2000	Tarun
2002	Rani

R2

Id	Name
1015	Anita
2005	Varun
2002	Rani
1008	Anisha

Find the result of the following operations:

- **R1 NATURAl JOIN R2**
- **R2 DIFFERENCE R1**
- **R1 INTERSECTION R2**
- **R1 UNION R2**

Q2. Enumerate any four types of users of the database system.

Consider the database **EMP** with the tables **Employee**, **Company and Works:**

Employee(empNo, empName, street, empCity, salary)

Company(compNo,compName,compCity)

Works(empNo,compNo)

Identify the primary keys and foreign keys of all given tables.

Write SQL commands for the following:

- Rename the attribute **empNo** of **Employee** table to **EID**.
- Find the names of all employees who live in the same city as the company for which they work.
- Find the name of the employee who earns the highest salary.
- Find the details of all employees in descending order of their salary.
- Find the names of all companies located in **"Mumbai"**.

Write a SQL statement to modify the city of the company **"ABC Corporations"** to "**Delhi**".

Q3. A Sports database is to be constructed to keep track of the teams and games of a sport league. A team has a team name (**Tname**) and unique team id (**Tid**). A player has a name (**Pname**), unique player id (**Pid**) and the team id (**Tid)** to which he/she belongs. It is desired to keep track of the type of the game **(Type)**, its players **(Pid)**, result of a game **(res)** and game id (**Gid**). Construct an ER diagram for the Sports database with following constraints:

1. A team has a number of players, but a player belongs to one team.
2. A player may play many games, and a game may have many players.

Consider the universal relation **R = {A,B,C,D,E,F,G,H,I,J}** and the set of functional dependencies: **F = { AB -> C, BD -> EF, AD->GH, G -> I, H -> J}**. Identify the key for the given relation. Assuming all attributes are single-valued and

non-composite, show that the given relation **R** is first normal form (1NF). Check if the relation is in 2NF. If not, decompose **R** into **2NF**. Further decompose the resulting relations into **3NF**, if required.

Q4. Describe three-tier architecture of the database with the help of a diagram.

Consider the following relations **Customer_Details** and **Product_Details** having the following schema:

Customer_Details

Cust_Code	Cust_Name	Cust_ContactNo

Order_Details

O_Code	Cust_Code	O_Date	O_Amount

The **Cust_Code** field is a foreign key in the **Order_Details** table that references the **Customer_Details** table.

Write a SQL statement using **BETWEEN** operator that produces the same result as the following SQL statement:

```
SELECT *
FROM Order_Details
WHERE O_Date >= '1/1/1997' AND O_Date <= '1/1/1998';
```

Write SQL commands to perform the following operations:

- Create a database schema **Retail,** comprising two tables **Customer_Details** and **Order_Details.**
- Drop the column **O_Date** from the **Order_Details** table.
- Delete the table schema of the table **Order_Details**.

Q5. What is meant by data independence? Give one example of each of the logical and physical data independence.

Consider the following relation **EMP_DEPT:**

Empno	Ename	BDate	mobileNo	Dnumber	Dname	MgrNo
E101	Rahul	02/10/1982	98346728457	D3	HR	E106
E104	Deepti	06/05/1983	87392747599	D1	Sales	E112

E110	Swati	05/07/1985	77563835658	D5	IT	E101
E123	Ankur	03/03/1987	38438475675	D2	Admin	E105

Consider the following operations on the given relation **EMP_DEPT**:

- Insert a new department with **Dnumber = "D4"**, **Dname = "Research"**, and **MgrNo = "E101"**.
- Delete a record with **Empno = "E110"**.

Will the above two operations result in any anomaly? Justify your answer.

Q6. Give three advantages and one disadvantage of the database system approach as compared to traditional file system approach?

Suggest cardinality ratios of the given relationships based on common-sense meaning. In each case justify your answer.

Entity 1	Entity 2	Relationship name
Student	Course	Takes
Customer	Product	Purchases
Country	President	Governed_By
Person	Smart Phone	Owns

Consider the following relations:

Student

EnrolNo	**Name**	**Dept_no**
CS001	Varun Sharma	10
CS002	Kajal Jain	10
PHY003	Shikha Chawla	20
CHEM004	Suresh	30

Department

Dept_no	**Dept_name**
10	Computer Science
20	Physics
30	Chemistry

Assume that **Dept_no** of **Student** relation is referencing **Dept_no** of **Department** relation. Consider a situation that an attempt is made to delete the tuple with **Dept_no = 30** from the **Department** table. Suggest two methods that a DBMS may deploy to ensure the database integrity in response to such an attempt?

Unique paper Code : 32345201_OC

Name of the Course : B.Sc.(H) Computer Science

Name of the Paper : Introduction to Database Systems (Generic Elective - II)

Semester : II

Year of Admission : 2015, 2016, 2017 & 2018

Duration: Three hours Maximum Marks: 75

Instructions for candidates:

Attempt any four questions.

All questions carry equal marks.

*The complete answer to a question must appear in a single **PDF** file.*

You may make suitable assumptions in a question and state them clearly.

Q1. Illustrate the following with the help of an example in context to relational data model:

- Relation schema
- Attribute
- Tuple
- Degree of a relation
- Cardinality of a relation

Give one advantage and one disadvantage of the relational model as compared to traditional file systems.

Illustrate the concept of a weak entity, its partial key and its identifying relationship using a suitable example.

Consider the following relations **R1** and **R2** having the same schema:

R1

Id	Name
1008	Anisha
1012	Suman
2000	Tarun
2002	Rani

R2

Id	Name
1015	Anita
2005	Varun
2002	Rani
1008	Anisha

Find the result of the following operations:

- **R1 NATURAl JOIN R2**
- **R2 DIFFERENCE R1**
- **R1 INTERSECTION R2**
- **R1 UNION R2**

Q2. Enumerate any four types of users of the database system.

Consider the database **EMP** with the tables **Employee**, **Company and Works:**

Employee(empNo, empName, street, empCity, salary)

Company(compNo,compName,compCity)

Works(empNo,compNo)

Identify the primary keys and foreign keys of all given tables.

Write SQL commands for the following:

- Rename the attribute **empNo** of **Employee** table to **EID**.
- Find the names of all employees who live in the same city as the company for which they work.
- Find the name of the employee who earns the highest salary.
- Find the details of all employees in descending order of their salary.
- Find the names of all companies located in **"Mumbai"**.

Write a SQL statement to modify the city of the company **"ABC Corporations"** to "**Delhi**".

Q3. A Sports database is to be constructed to keep track of the teams and games of a sport league. A team has a team name (**Tname**) and unique team id (**Tid**). A player has a name (**Pname**), unique player id (**Pid**) and the team id (**Tid)** to which he/she belongs. It is desired to keep track of the type of the game **(Type)**, its players **(Pid)**, result of a game **(res)** and game id (**Gid**). Construct an ER diagram for the Sports database with following constraints:

1. A team has a number of players, but a player belongs to one team.
2. A player may play many games, and a game may have many players.

Consider the universal relation **R = {A,B,C,D,E,F,G,H,I,J}** and the set of functional dependencies: **F = { AB -> C, BD -> EF, AD->GH, G -> I, H -> J}**. Identify the key for the given relation. Assuming all attributes are single-valued and

non-composite, show that the given relation **R** is first normal form (1NF). Check if the relation is in 2NF. If not, decompose **R** into **2NF**. Further decompose the resulting relations into **3NF**, if required.

Q4. Describe three-tier architecture of the database with the help of a diagram.

Consider the following relations **Customer_Details** and **Product_Details** having the following schema:

Customer_Details

Cust_Code	Cust_Name	Cust_ContactNo

Order_Details

O_Code	Cust_Code	O_Date	O_Amount

The **Cust_Code** field is a foreign key in the **Order_Details** table that references the **Customer_Details** table.

Write a SQL statement using **BETWEEN** operator that produces the same result as the following SQL statement:

```
SELECT *
FROM Order_Details
WHERE O_Date >= '1/1/1997' AND O_Date <= '1/1/1998';
```

Write SQL commands to perform the following operations:

- Create a database schema **Retail,** comprising two tables **Customer_Details** and **Order_Details.**
- Drop the column **O_Date** from the **Order_Details** table.
- Delete the table schema of the table **Order_Details**.

Q5. What is meant by data independence? Give one example of each of the logical and physical data independence.

Consider the following relation **EMP_DEPT:**

Empno	Ename	BDate	mobileNo	Dnumber	Dname	MgrNo
E101	Rahul	02/10/1982	98346728457	D3	HR	E106
E104	Deepti	06/05/1983	87392747599	D1	Sales	E112

E110	Swati	05/07/1985	77563835658	D5	IT	E101
E123	Ankur	03/03/1987	38438475675	D2	Admin	E105

Consider the following operations on the given relation **EMP_DEPT**:

- Insert a new department with **Dnumber = "D4"**, **Dname = "Research"**, and **MgrNo = "E101"**.
- Delete a record with **Empno = "E110"**.

Will the above two operations result in any anomaly? Justify your answer.

Q6. Give three advantages and one disadvantage of the database system approach as compared to traditional file system approach?

Suggest cardinality ratios of the given relationships based on common-sense meaning. In each case justify your answer.

Entity 1	Entity 2	Relationship name
Student	Course	Takes
Customer	Product	Purchases
Country	President	Governed_By
Person	Smart Phone	Owns

Consider the following relations:

Student

EnrolNo	**Name**	**Dept_no**
CS001	Varun Sharma	10
CS002	Kajal Jain	10
PHY003	Shikha Chawla	20
CHEM004	Suresh	30

Department

Dept_no	**Dept_name**
10	Computer Science
20	Physics
30	Chemistry

Assume that **Dept_no** of **Student** relation is referencing **Dept_no** of **Department** relation. Consider a situation that an attempt is made to delete the tuple with **Dept_no = 30** from the **Department** table. Suggest two methods that a DBMS may deploy to ensure the database integrity in response to such an attempt?

S.No. of Question Paper :

Unique Paper Code : 12273402_OC

Name of the Paper : Data Analysis

Name of the course : BA(H) Economics CBCS-SEC

Semester : IV

Duration : 2 Hours Maximum Marks: 75

Instructions for Candidates

1. Write your Roll No. on top immediately on receipt of the question paper.
2. Answer **any 4** questions.
3. All questions carry equal (18.75) marks.
4. Answers may be written either in English or in Hindi, but the same medium should be used throughout the paper.

परीक्षार्थियों के लिए निर्देश

1. प्रश्नपत्र मिलते ही निर्धारित स्थान पर अपना अनुक्रमांक लिखें |
2. किन्ही चार प्रश्नों का उत्तर दीजिये |
3. सभी प्रश्नों के अंक (18.75) समान है |
4. प्रश्न का उत्तर हिंदी अथवा अंग्रेजी माध्यम में लिखा जा सकता है परन्तु सभी प्रश्नों का उत्तर एक ही माध्यम में होना चाहिए |

Q1.a) Let $y_1, y_2, ..., y_n$ be a random sample from the pdf $f_y(y, \theta) = \frac{2y}{\theta^2}, 0 \leq y \leq \theta$.

Let two estimators be $\hat{\theta}_1 = \frac{3}{2}\bar{y}$ and $\hat{\theta}_2 = \frac{4}{5}\bar{y}$, be both unbiased. Which is more efficient?

b) The lifespan (in '000 hours) of four LED bulbs of 07 watts are as follows:

40,46,48, 50

(i) How many samples of size 2 can be formed in case when sampling is done with replacement and without replacement?

ii) Write all samples of size 2 with replacement from the above observations. Compute the sampling distribution and find mean and standard error of the distribution.

(iii) Write all samples of size 3 with replacement from the above observations. Compute the sampling distribution and find mean and standard error of the distribution.

(iv) Compare means and standard errors and draw the conclusion.

Q2.a) If there is perfect positive correlation between x and y. What can you say about correlation between:

i) Log x and Log y

ii) 2X+3, 5Y-6

b) For the following data on two variables, compute correlation coefficient between their levels and their Logs:

X	2	3	1	10	81
Y	8	9	4	16	100

(log 2 = 0.30103, log 3= 0.477121)

Q3. a) Which measure(s) will suit best in each of the following situation and Why?

i) In a school, students are graded on equal intervals except that all students scoring less than 40% are considered fail and clubbed as a single category. A visitor wishes to compute average marks a student obtains in this school given this data.

ii) In a survey, age has been categorized into various intervals as :

<15, 15-25,25-35,35-45,45 and above

Surveyor wishes to compute average age.

iii) A store outlet manager wishes to put apparels on sale, but wishes to exclude one size for each dress which is otherwise in high demand.

iv) It is known that two batsman have equal averages. But the coach wishes to know that if they are equally consistent too or one of them is more consistent.

v) The data on income of Indian individuals is given. The policymaker wishes to know the average income, and wants to know whether majority of people have lower levels of income or not.

vi) In a particular college 10,000 applicants applied in a specified course, where only 100 seats are available and admission is on merit basis. The dean needs to announce cut-off.

Q4. a) if variance of X = 9, regression equations : 8X-10Y+66 = 0, 40X-18Y=214. What are:

i) mean values of X and Y.

ii) correlation coefficient between X and Y.

iii) standard deviation of Y?

b) It was believed that NIFTY for IT companies depends on NIFTY 50 index, so a regression was run and following results were obtained:

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.930152
R Square	0.865183
Adjusted R Square	0.862973
Standard Error	615.6311
Observations	63

ANOVA

	df	*SS*	*MS*	*F*
Regression	1	148366090.68	148366090.68	391.47
Residual	61	23119097.92	379001.61	
Total	62	171485188.6		

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	5589.786	500.1509596	11.18	0.000
NIFTY 50	1.338237	0.067637312	19.79	0.000

Given above information answer the following:

i) Is it true that NIFTY 50 causes NIFTY IT? Explain why or why not?

ii) Compute coefficient of correlation between two.

iii) Is this model good or not? Explain which all values would you use and what do they show?

iv) Construct a 95% confidence interval for coefficient of NIFTY 50 and interpret it.

Q5. a) Suppose there are 3 coins in a bag. One of them is a fair coin, but the others are biased trick coins. When flipped, the three coins come up heads with probability 0.5, 0.6, 0.1 respectively. Suppose one of these three coins uniformly at random and flip it three times. What is P (HTT)? (That is, it comes up heads on the first flip and tails on the second)

b) There are 5 men and 8 women in a ballroom dancing class. If four men and four women are chosen and paired off, how many pairings are possible?

c) The volume in a set of wine bottles is known to follow a N(μ, 25) distribution. You take a sample of the bottles and measure their volumes. How many bottles do you have to sample to have a 95% confidence interval for μ with width 1?

Q6. a) For the following data, compute consumer price index for beverages using taking 2019 as base year:

Good	**2019**		**2020**		**2021**	
	Quantity	**Price**	**Quantity**	**Price**	**Quantity**	**Price**
Pepsi	10	6	12	8	5	10
Fanta	9	7	10	10	8	9
Coffee	12	10	6	6	12	15
Tea	6	5	5	6	10	7

Also, compute inflation rate between 2019-20 and 2020-21.

b) If price index increases from 100 to 150, what can you say about value of rupee during same period of time?

SET-2

Unique Paper Code: 12277608

Name of the Paper : Environmental Economics

Name of the Course : B.A. (Hons.) Economics - CBCS-DSE

Semester : VI

Duration: 3 hours and additional one hour for down loading question paper and scanning and uploading copy of the answer sheet

Maximum Marks : 75

Instructions for Candidates: Answer any four questions. All questions carry equal marks. Answer may be written in Hindi or English but the same medium should be followed throughout the paper

परीक्षार्थियों के लिए निर्देश: किन्ही भी चार प्रश्नों के उत्तर दीजिये । सभी प्रश्नों के अंक समान हैं। उत्तर हिंदी या अंग्रेजी माध्यम में दिए जा सकते है लेकिन पूरे पेपर में एक ही माध्यम का पालन किया जाना चाहिए।

Q1. (a) Distinguish between weak sustainability and strong sustainability paradigm. Which of the two approaches is ecologically sensitive?(9.75marks)

(b) Distinguish between Biocentrism and Anthropocentrism. And give appropriate examples. (9 marks)

Q1 (अ) कमजोर स्थिरता और मजबूत स्थिरता प्रतिमान के बीच अंतर बताइये । दोनों में से कौन सा दृष्टिकोण पारिस्थितिक रूप से संवेदनशील है?

(ब) जीवद्रव्यवाद और मानवशास्त्र के बीच उपयुक्त उदाहरण देकर अंतर बताइये ।

Q2. Write short note(any two) on:

(i)User value and non user value.

(ii)Hedonic values and prices.

(iii)Tradable permits.

Q2 संक्षिप्त नोट लिखें (कोई भी दो):

(i) उपयोगकर्ता मूल्य और गैर उपयोगकर्ता मूल्य।

(ii) हेडोनिक मूल्य और कीमत ।

(iii) व्यापार योग्य परमिट।

Q3. Consider the fishery example under two institutional arrangements: open access and private property regimes (the regime where individual profit maximising firm operates with a particular structure of well defined and enforceable property rights to the fishery). Use this example to show that the “Tragedy of commons” should be replaced with term “Tragedy of open access”? Explain your answer with appropriate diagram.(18.75marks)

Q3। दो संस्थागत व्यवस्थाओं के तहत मत्स्य उदाहरण पर विचार करें: खुली पहुंच और निजी संपत्ति शासन (शासन जहां व्यक्तिगत लाभ अधिकतम फर्म मछली पालन के लिए अच्छी तरह से परिभाषित और लागू करने योग्य संपत्ति अधिकारों की एक विशेष संरचना के साथ संचालित होता है)। यह दिखाने के लिए इस उदाहरण का उपयोग करें कि "सामान्य लोगों की त्रासदी" को "खुली पहुंच की त्रासदी" शब्द से बदला जाना चाहिए? उचित आरेख के साथ अपना उत्तर बताएं।

Q4. Write brief note on:

(i)Coase Theorem and its policy significance.

(ii)Precautionary Principle.

(iii)Economic incentive as a type of environmental regulation.

Q4। संक्षिप्त नोट लिखें:

(i) Coase प्रमेय और इसकी नीति महत्व।

(ii) एहतियाती(Precautionary) सिद्धांत।

(iii) पर्यावरणीय विनियमन के एक प्रकार के रूप में आर्थिक प्रोत्साहन।

Q5. (a)Consider a steel mill that is a monopolist in the goods market. The inverse demand function for steel production is D(Q)= 10-Q. Its marginal cost MC(Q) is constant and is equal to Rs.2. It produces smoke which is proportional of steel output (Q). Suppose the marginal damage from smoke is Rs.2 per unit of steel output and the monopolist is charged a Pigouvian tax of the same amount. Calculate:

(i)Unregulated output of steel, output with the Pigouvian tax and socially optimal output in the presence of the externality(smoke).(3marks)

(ii)The deadweight loss from unregulated monopolist taking into account the social cost of steel production.(3marks)

(iii)The deadweightloss from the Pigouvian tax.(4marks)

(b) Explain the concept of excludability and rivalry in the context of public goods and bad. In which category would you classify the following commodities?(8.75marks)

(i)Wired parks with controlled access.

(ii)Carbon emissions.

(iii)Acid Deposition

5 (अ) एक स्टील मिल पर विचार करें जो वस्तु बाजार में एकाधिकारी है। स्टील उत्पादन के लिए प्रतिलोम मांग फलन D (Q) = 10 - Q है। इसकी सीमांत लागत 2 रु पर स्थिर है। यह धुआं पैदा करता है जो इस्पात उत्पादन (Q) के समानुपाती होता है। मान लीजिए कि धुएं से सीमांत क्षति स्टील उत्पादन के 2 रुपये प्रति यूनिट है, एकाधिकार को एक ही राशि से Pigovian टैक्स लगाया जाता है गणना कीजिये :

(i) स्टील का अनियमित उत्पादन, Pigovian टैक्स के साथ आउटपुट और बाहरीता (धुएं) की उपस्थिति में सामाजिक रूप से इष्टतम उत्पादन।

(ii) स्टील उत्पादन की सामाजिक लागत को ध्यान में रखते हुए अनियमित एकाधिकार से Deadweight Loss ।

(iii) Pigovian टैक्स से Deadweight Loss.

(b) सार्वजनिक वस्तुओं और हानिकारक के संदर्भ में बहिष्करण और प्रतिद्वंद्विता की अवधारणा को समझाइए। आप किस श्रेणी में निम्नलिखित वस्तुओं को वर्गीकृत करेंगे?

(i) नियंत्रित पहुँच वाले बंद उद्यान (Wired Park)।

(ii) कार्बन उत्सर्जन।

(iii) अम्ल का जमाव (Acid Deposition)

Q6. State the conditions under which Stated preference method is superior to Revealed preference method . Explain different types of constructed markets. What are the difficulties in this method.(18.75marks)

Q6। उन स्थितियों के बारे में बताएं, जिनके तहत वरीयता विधि (Stated Preference Method) से श्रुत अधिमान पद्धति (Revealed preference method) है। विभिन्न प्रकार के निर्मित बाजारों की व्याख्या करें। इस विधि में क्या कठिनाइयाँ हैं।

NAME OF COURSE: BA (HONS) ECONOMICS
SCHEME/MODE OF EXAMINATION: CBCS DSE
SEMESTER : VI
NAME OF THE PAPER: MONEY AND FINANCIAL MARKETS
UPC/SUBJECTCODE: 12277606
MEDIUM OF INSTRUCTION: ENGLISH AND HINDI
MAX MARKS: 75

ALL QUESTIONS CARRY EQUAL MARKS.ANSWER ANY FOUR (4) QUESTIONS.
सभी प्रश्नों के अंक समान हैं। किन्हीं भी चार प्रश्नों के उत्तर दीजिये।

Ques1. (a) Differentiate between Exogenous and Endogenous money supply curves. What will be the impact of following events on each of these curves?

i. Rise in excess reserves holdings of banks (ER)
ii. Increase in use of digital mode of payments
iii. Central bank reduces the required reserve ratio (12)

(b) Discuss Free-rider problem in aggravating adverse selection and moral hazard problems in financial markets. (6.75)

1. (अ) बहिर्जात (Exogenous) और अन्तर्जात (Endogenous) मुद्रा आपूर्ति वक्र में अंतर बताइये । इनमें से प्रत्येक वक्र पर निम्नलिखित घटनाओं का क्या प्रभाव पड़ेगा?

(i) बैंकों के अतिरिक्त आरक्षित भंडार में वृद्धि (ER)

(ii) भुगतान के डिजिटल मोड के उपयोग में वृद्धि

(iii) केंद्रीय बैंक आवश्यक आरक्षित अनुपात को कम करता है (12)

(ब) वित्तीय बाजारों में प्रतिकूल चयन और नैतिक खतरे की समस्याओं में नि:शुल्क लाभार्थी समस्या की चर्चा कीजिये । (6.75)

Ques2. (a) "A key financial innovation in the 1980's that dramatically influences the role of financial intermediaries is the phenomenon of Asset Securitization". Briefly explain this statement. (8)

(b) Critically examine how the MCLR system is an improvement over Base rate system.

(10.75)

2. (अ) "1980 में एक महत्वपूर्ण वित्तीय नवाचार जो वित्तीय मध्यस्थों की भूमिका को नाटकीय रूप से प्रभावित करता है, परिसंपत्ति प्रतिभूतिकरण की घटना है"। संक्षेप में इस कथन की व्याख्या कीजिए। (8)

(ब) MCLR प्रणाली बेस रेट प्रणाली में सुधार कैसे है आलोचनात्मक व्याख्या कीजिये । (10.75)

Ques3. (a) A Coupon Bond maturing in one year has a face value of Rs.1000 and coupon rate of 8%. If the market interest rate is 6% at the time of purchase, calculate:

i. Price of the coupon bond
ii. Current yield
iii. Yield to maturity of this bond

What effect would a rise in the market rate of interest to 8% have on its price and yield? (12)

(b) What properties should a variable have to serve as an intermediate target of monetary policy? (6.75)

3. (क) एक वर्ष में परिपक्व होने वाले एक कूपन बॉन्ड की कीमत 1000 रु और दर 8% है। यदि खरीद के समय बाजार की ब्याज दर 6% है, तो गणना करें:

(i) कूपन बांड की कीमत

(ii) वर्तमान उपज

(iii) इस बंधन की परिपक्वता की ओर

ब्याज की बाजार दर में 8% की वृद्धि से इसकी कीमत और उपज पर क्या प्रभाव पड़ेगा? (12)

(ख) एक चर को मौद्रिक नीति के मध्यवर्ती लक्ष्य के रूप में क्या करना चाहिए? (6.75)

Ques4. (a) Suppose investors prefer one year bonds to two year bonds and will purchase a two year bond only if they expect to receive an additional 4% over the return from holding one year bond. Currently one year bonds yield 5% but investors expect yield to fall to 4% next year.

i. Which of the three models of term structure of interest rates is relevant in this case? Give reason.
ii. What is the yield on 2-year bond?
iii. Is the yield curve upward sloping, flat or downward sloping? Give reason. (6.25)

(b) Suppose a call option on a stock has an exercise price of Rs. 700 and a cost of Rs. 20, and suppose you buy the call option. Identify the profit to your investment, at the call's expiration, for each of these values of the underlying stock: Rs. 250, Rs. 700, Rs. 1000, Rs. 690, Rs. 710.

(12.5)

4.(अ) मान लीजिए कि निवेशक एक से दो साल के बॉन्ड को पसंद करते हैं और दो साल के बॉन्ड की खरीद तभी करेंगे, जब वे एक साल के बॉन्ड रखने से रिटर्न पर अतिरिक्त 4% प्राप्त करने की उम्मीद करेंगे। वर्तमान में एक वर्ष के बॉन्ड में 5% की प्राप्ति होती है लेकिन निवेशकों को अगले वर्ष 4% तक की गिरावट की उम्मीद है

(i) ब्याज दरों की अवधि संरचना के तीन मॉडल में से कौन सा इस मामले में प्रासंगिक है? कारण बताईये।

(ii) 2-वर्षीय बॉन्ड पर उपज क्या है?

(iii) उपज वक्र (Yield Curve) ऊपर की ओर झुका हुआ, सपाट या नीचे की ओर झुका हुआ है? कारण बताईये। (6.25)

(बी) मान लीजिए कि किसी शेयर पर कॉल का विकल्प रुपये का प्रयोग मूल्य 700 रु और लागत 20 रु है। और मान लीजिए कि आप कॉल विकल्प खरीदते हैं। अंतर्निहित स्टॉक के इन मूल्यों 250 रु, 700 रु, 1000 रु, 690 रु, 710 रु में से प्रत्येक के लिए, कॉल की समाप्ति पर, अपने निवेश के लिए लाभ की पहचान कीजिये । (12.5)

Ques 5 (a) Examine various issues involved in the formulation of monetary policy and inflation targeting in the Indian context. (10.75)

(b) Briefly describe the four areas in which BASEL III is an enhancement over BASEL II. . (8)

5 (अ) भारतीय संदर्भ में मौद्रिक नीति और मुद्रास्फीति लक्ष्यीकरण के निर्माण में शामिल विभिन्न मुद्दों का परीक्षण कीजिये । (10.75)

(ब) संक्षिप्त में चार क्षेत्रों की व्याख्या कीजिये जिसमें बेसेल III में बेसल II से अधिक की वृद्धि है। (8)

Ques 6. Write short notes on any two of the following: (18.75)

(a) Policy Rate Corridor
(b) Adjusted H
(c) Policy responses to the NPA crisis in the Indian Banking Sector since 2008

प्रश्न 6. निम्नलिखित में से किसी दो पर संक्षिप्त नोट लिखें: (18.75)

(ए) नीतिगत मूल्य गलियारा (Policy Rate Corridor)

(बी) समायोजित H

(c) 2008 से भारतीय बैंकिंग क्षेत्र में NPA संकट के लिए नीतिगत प्रतिक्रियाएँ

Name of the Paper: Financial Economics

Name of Course: B.A. (Hons.) Economics – CBCS – DSE

UPC: 12277612

Semester: VI

Duration: 3 Hours **Maximum Marks:** 75

Instructions to Candidates:

- Use of scientific calculator is allowed.
- Attempt any four questions out of six.
- All questions carry equal marks. Subparts of a question carry equal weightage.
- Answers may be written either in English or in Hindi; but the same medium should be used throughout the paper.

परीक्षार्थियों के लिये निर्देश :

· वैज्ञानिक कैलकुलेटर के उपयोग की अनुमति है।
· छह में से किसी भी चार प्रश्नों का उत्तर दीजिये।
· सभी प्रश्नों के अंक समान हैं। एक प्रश्न के उप-भाग के अंक भी समान हैं।
· उत्तर अंग्रेजी या हिंदी में लिखे जा सकते हैं; लेकिन पूरे पेपर में एक ही माध्यम का उपयोग किया जाना चाहिए।

1. (a) Define NPV and IRR. Which of these criteria is the most appropriate for investment evaluation? Explain your answer with the help of an example.

   (b) Find the duration D and the modified duration D_M of a perpetual annuity that pays an amount A at the beginning of each year, with the first such payment being 1 year from now. Assume constant interest rate *r* compounded yearly.

   (c) The current price of government treasury bonds is as follows:

Maturity (in years)	Coupon	Price
1	0 percent	$97.474
2	5 percent	$99.593

   Assuming all coupons are annually paid with each bond having a par value of $100. What are the 1-year and 2-year spot rates? What is the forward rate between year 1 and 2?

1. (अ) NPV और IRR को परिभाषित करें। निवेश के मूल्यांकन के लिए इनमें से कौन सा मापदंड सबसे उपयुक्त है? एक उदाहरण की मदद से अपना उत्तर दीजिये ।

(ब) प्रत्येक वर्ष की शुरुआत में एक राशि का भुगतान करने वाले एक सतत वार्षिकी की अवधि D और संशोधित अवधि DM निकालिये, जो प्रत्येक वर्ष की शुरुआत में एक राशि का भुगतान करता है, इस तरह का पहला भुगतान अब से 1 वर्ष के लिए किया जाएगा। निरंतर ब्याज दर r को सालाना आधार मान लें।

(स) सरकारी ट्रेजरी बांड की वर्तमान कीमत निम्नानुसार है:

Maturity (in years)	Coupon	Price
1	0 percent	$97.474
2	5 percent	$99.593

मान लिया जाए कि प्रत्येक कूपन को प्रत्येक बॉन्ड के साथ $ 100 का सममूल्य मूल्य दिया जाता है। 1-वर्ष और 2-वर्षीय स्पॉट रेट क्या हैं? वर्ष 1 और 2 के बीच की दर क्या है?

2. (a) The CAPM changes our concept of risk of an asset from that of σ to that of β. Show this by deriving the relationship between the expected rate of return of an individual asset with its individual risk.

(b)What is short selling? Discuss how the optimal set differs under short selling as compared to without short selling.
(c) Consider a risky venture with a per unit share price of $875 which is expected to increase after a year. The standard deviation of the return of the venture is σ = 40%. Currently the risk to $1,000-free rate is 10%. The expected rate of return on the market portfolio is 17%, with a standard deviation of 12%. Find the expected rate of return of this venture and the expected rate of return predicted by capital market line. Compare the two and comment.

2. (अ) पूंजी परिसंपत्ति मूल्य निर्धारण मॉडल (CAPM) एक परिसंपत्ति के जोखिम की हमारी अवधारणा को σ से β के जोखिम में बदल देता है। अपने व्यक्तिगत जोखिम के साथ एक व्यक्तिगत संपत्ति की वापसी की अपेक्षित दर के बीच संबंध प्राप्त करके इसे दिखाएं।

(ब) शॉर्ट सेलिंग क्या है? चर्चा करें कि कैसे कम बिक्री के बिना इष्टतम सेट कम बिक्री के तहत भिन्न होता है।

(स) $ 875 प्रति यूनिट शेयर की कीमत के साथ एक जोखिम भरे उद्यम पर विचार करें जो एक साल बाद बढ़ने की उम्मीद है। उद्यम की वापसी का मानक विचलन σ= 40% है। वर्तमान में $1,000-मुक्त दर का जोखिम 10% है। बाजार पोर्टफोलियो पर वापसी की अपेक्षित दर 17% है, जिसमें 12% का मानक विचलन है। इस उद्यम की वापसी की अपेक्षित दर और पूंजी बाजार रेखा द्वारा अनुमानित प्रतिफल की अपेक्षित दर ज्ञात कीजिए। दोनो की तुलना करके टिप्पणी कीजिये।

3. (a) A trader owns a commodity as part of a long-term investment portfolio. The trader can buy the commodity for $950 per ounce and sell it for $949 per ounce. The trader can borrow funds at 6%

per year and invest funds at 5.5% per year. (Both interest rates are expressed with annual compounding.) For what range of one-year forward prices does the trader have no arbitrage opportunities? Assume there is no bid–offer spread for forward prices.

(b) The price of an American put on a non-dividend-paying stock is $44.5. The stock price is $408, the strike price is $410, and the expiration date is in 6 months. The risk-free interest rate is 2.5% per half year. Derive upper and lower bounds for the price of an American call on the same stock with the same strike price and expiration date.

(c) What is the effect of change in risk-free interest rate and future dividends on price of an option?

3. (अ) एक व्यापारी दीर्घकालिक निवेश पोर्टफोलियो के हिस्से के रूप में एक कमोडिटी का मालिक है। व्यापारी प्रति औंस $950 के लिए कमोडिटी खरीद सकता है और $949 प्रति औंस के लिए बेच सकता है। व्यापारी प्रति वर्ष 6% पर धनराशि उधार ले सकता है और प्रति वर्ष 5.5% पर धन का निवेश कर सकता है। (दोनों ब्याज दरों को वार्षिक चक्रवृद्धि के साथ व्यक्त किया जाता है।) एक वर्ष की आगे की कीमतों के लिए व्यापारी के पास कोई मध्यस्थ अवसर नहीं है? मान लें कि आगे की कीमतों के लिए कोई बोली-प्रस्ताव नहीं फैला है।

(ब) गैर-लाभांश-भुगतान वाले स्टॉक पर लगाए गए एक अमेरिकी की कीमत $ 44.5 है। शेयर की कीमत $ 408 है, स्ट्राइक मूल्य $ 410 है, और समाप्ति की तारीख 6 महीने में है। जोखिम मुक्त ब्याज दर प्रति छमाही 2.5% है। एक ही स्ट्राइक मूल्य और समाप्ति तिथि के साथ एक ही स्टॉक पर एक अमेरिकी कॉल की कीमत के लिए ऊपरी और निचले सीमा को निकालिये।

(स) एक विकल्प की कीमत पर जोखिम-मुक्त ब्याज दर और भविष्य के लाभांश में परिवर्तन का क्या प्रभाव है?

4. (a) Explain the difference between Futures and Forwards Contract.

(b) Suppose that a futures contract with 4 months to maturity is used to hedge the value of a portfolio over the next 3 months in the following situation:

Value of S&P 500 index: 1000
S&P 500 futures price: $1,010
Value of portfolio: $5,050,000
Risk free interest rate: 4% per annum
Dividend yield on index: 1% per annum
Beta of the portfolio: 1.5
One futures contract is for the delivery of $250 times the index

i. What position the company will take in futures contract?
ii. Calculate the gain/loss from the futures contracts if index and futures price turn out to 900 and 902 respectively.
iii. Calculate the expected value of the portfolio and the hedger's position at the end of 3 months.

(c) It is possible to buy three-month call options and three-month puts on stock Q. Both options have an exercise price for $60 and both are worth $10. Is a six-month call with an exercise price of $60 more or less valuable than a similar six-month put? Show.

4. (अ) फ्यूचर्स और फॉरवर्ड कॉन्ट्रैक्ट के बीच अंतर स्पष्ट करें।

(ब) मान लीजिए कि परिपक्वता के लिए 4 महीने के लिए एक वायदा अनुबंध का उपयोग निम्नलिखित स्थिति में अगले 3 महीनों में एक पोर्टफोलियो के मूल्य को हेज करने के लिए किया जाता है:

Value of S&P 500 index: 1000
S&P 500 futures price: $1,010
Value of portfolio: $5,050,000
Risk free interest rate: 4% per annum
Dividend yield on index: 1% per annum
Beta of the portfolio: 1.5
One futures contract is for the delivery of $250 times the index

(i) कंपनी फ्यूचर कॉन्ट्रैक्ट में क्या पोजीशन लेगी?

(ii) फ्यूचर्स कॉन्ट्रैक्ट्स से लाभ/हानि की गणना करें यदि इंडेक्स और फ्यूचर्स की कीमत क्रमशः 900 और 902 हो जाती है।

(iii) 3 महीने के अंत में पोर्टफोलियो के अनुमानित मूल्य और हेजर्स की स्थिति की गणना करें।

(स) तीन-महीने के कॉल ऑप्शंस खरीदना संभव है और तीन महीने स्टॉक q पर रखता है। दोनों विकल्पों का उपयोग मूल्य $60 है और दोनों की कीमत $10 है। छह महीने के पुट की तुलना में $60 या उससे कम मूल्यवान व्यायाम मूल्य के साथ छह महीने की कॉल है? दर्शाइये ।

5. (a) Explain four ways in which a company repurchases its stocks.

(b) “M.M. Proposition warns us that higher leverage increases both expected equity returns and equity risk. It does not increase shareholder value.” Explain with the help of an example.

(c) “The dividend policy is irrelevant in a world without taxes, transaction costs, or other markets imperfections.” Explain with the help of an example.

5. (अ) एक कंपनी के शेयरों को पुनर्खरीद करने के चार तरीके बताइये ।

(ब) “M.M. प्रस्ताव हमें चेतावनी देता है कि उच्च उत्तोलन (leverage) में अपेक्षित इक्विटी रिटर्न और इक्विटी जोखिम दोनों बढ़ जाते हैं। यह शेयरधारक मूल्य में वृद्धि नहीं करता है।" एक उदाहरण की मदद से समझाएं।

(स) "लाभांश नीति बिना करों, लेनदेन लागत, या अन्य बाजारों की खामियों के बिना एक दुनिया में अप्रासंगिक है।" एक उदाहरण की मदद से समझाएं।

6. (a) Rank the following bonds in terms of descending duration (without calculating) and give reasons for the for the same:

Bond	Coupon	Time to Maturity	Yield to Maturity
A	10%	30 years	10%
B	0	30 years	10%
C	10%	30 years	7%

(b) If returns are positively correlated, it is more difficult to reduce variance and there may be a lower limit to what can be achieved. Show mathematically.

(c) What do we mean by Principal Protected Note? Explain using example.

6. (अ) अवरोही अवधि (गणना के बिना) के संदर्भ में निम्नलिखित बॉण्ड को रैंक करें और उसके लिए कारण दें:

Bond	Coupon	Time to Maturity	Yield to Maturity
A	10%	30 years	10%
B	0	30 years	10%
C	10%	30 years	7%

(ब) यदि प्रतिफल सकारात्मक रूप से सहसंबंधित हैं, तो भिन्नता को कम करना अधिक कठिन है और जो हासिल किया जा सकता है उसकी निचली सीमा हो सकती है। गणितीय रूप से दिखाएं।

(स) प्रधान संरक्षित नोट से क्या अभिप्राय है? उदाहरण देकर समझाइए।

[This question paper contain 2 printed pages]

Your Roll No……..

Name of the Course : B.A.(Programme)
Unique Paper Code : 62353424_OC
Name of the Paper : SEC-2: Computer Algebra System
Semester : IV

Time: 3 Hours **Max. Marks: 38**

Instructions for Candidate

- Write your Roll No. on the top immediately on receipt of this question paper.
- This question paper has six questions in all. Attempt any four questions. All questions carry equal marks.
- Using anyone of the CAS:=Mathematica/Maple/Maxima/any other to answer the questions.

1. Write the commands to calculate the $\cos(\frac{\pi}{3})$ and the Binomial Coefficient$\binom{8}{2}$. Write the commands to find the prime factorization of number 15116544. Let $f(x) = \frac{x}{1+x^3}$ then write the commands to calculate $f'(x)$, $f'(0)$ and $f'(1)$. 9.5

P.T.O

2. Suppose matrix $M = \begin{bmatrix} 1 & 2 \\ 3 & 1 \end{bmatrix}$ then write the commands to calculate the matrix power $M^2, M^3 \; and \; M^4$. Write the commands to find the solutions of the given equations $4x + 5y = 13 \; and \; x - y = 1$. Write the commands to plot the function $f(x) = \tan(x)$ when $-\pi \leq x \leq \pi$. 9.5

3. Write the commands to plot the graph of the function $y = x^2$ when $-5 \leq x \leq 5$ and also write the command how to get the axes to intersect at point $(1,1)$. Write the commands to plot the following three functions graphs on the same set of axes, while functions are $f(x) = 1 + x, \; g(x) = x^2 \; and \; h(x) = x^3$ while color of first graph should be green and second graph should be in dashed style and color of third graph should be red. Write the command to make a table of first 40 integers, but use only Table command(twice), do not use Partition or Range in the following format

1 2 3 4 5 6 7 8

9 10 11 12 13 14 15 16 9.5

4. Write the input and output code to solve the equation $x^2 = 20$ with three different commands. Also explain about these commands when and why we use them. Write the input code only for the plotting of the function $g(x, y) = \sin(2x) + \cos(3y)$ when $-2\pi \leq x, y \leq 2\pi$. 9.5

5. Suppose that we have a function $(x) = cos^2(x) + sin^2(x) + x^3 - x^2 + 1$, then write the command to find its first derivative and second derivative and plot the second derivative. Write the command to calculate the definite integral of the function $h(x) = 1 + x^2 + x^3 + \frac{1}{1+x^2}$ from 0 to 1. Write the command to calculate the limit of the function $\lim_{n \to 2} \left[\frac{1}{n-2} - \frac{1}{n^2-3n+2}\right]$. 9.5

6. Write the command to enter the matrices $A = \begin{bmatrix} 1 & 1 & 2 \\ 2 & 3 & 2 \\ 4 & 1 & -1 \end{bmatrix}$ & $B = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 1 & 1 \\ 2 & 3 & 1 \end{bmatrix}$ then write the command to find matrix multiplication of A & B. Also, write the command to find the transpose matrix of A and determinant of matrix B. And write the command to put the matrix A & B in stack form. 9.5

Unique Paper Code	: 42343408- OC
Name of the Course	: B.Sc. Programme (CBCS)
Name of the Paper	: PHP Programming (SEC)
Semester	: IV Semester
Duration	: 3 Hour
Maximum Marks	: 75 Marks
Year of Admission	: 2015, 2016, 2017 & 2018

Instructions for Candidates:

Attempt any **four** questions. All the Questions carry equal marks.

Q1. Explain Arithmetic, Logical and Conditional operators available in PHP. Differentiate between *echo* and *print* statements. Write a PHP script that finds the sum of first n odd numbers.

Q2. Explain the **POST** method and write its advantages. Differentiate between *include()* and *require()*. Write PHP code for reading two values from an HTML form and display these values.

Q3. What is the scope of a variable? Explain the scope of local and global variables in a function with example. Explain the difference between *chop()* and *ltrim()* with example. Write a PHP script that removes the whitespaces from a string.

Sample string : " `The quick " " brown fox "`
Expected output : "`Thequick""brownfox`"

Q4. Write a PHP program to sort a given array. Differentiate between the following with suitable examples:-

- `break` and `continue` statement
- `for` and `foreach` loop
- `implode()` and `explode()` functions

Q5. What is a regular expression? Explain `preg_match()` and `preg_replace()` functions giving suitable examples of each. Write the prototype of the function to remove all HTML tags from a string passed to a form. Write a PHP script to display first 10 numbers of Fibonacci series.

Q6. Describe the loop that should be used to iterate over an associative array with example.
Write a PHP function to test whether a number is less than 30, 20 or 10 using ternary operator.
Write a PHP function to print the following sum using recursion:
$1^3+2^3+3^3+....n^3$.

Unique Paper Code: **62344414-OC**

Name of the Course: **B.A. Programme: DSC-4A**

Name of the Paper: **Multimedia Systems and Applications OC (CBCS)**

Semester: **IV**

Duration: **3 Hours**

Maximum Marks: **75**

Students admitted in the year: **2015, 2016, 2017 & 2018**

Instructions for Candidates

Attempt any **FOUR** questions.

All questions carry ***equal*** marks.

A question **MUST** be uploaded in the form of a single PDF file.

Q1)

Suppose you are creating a multimedia presentation.

- Enumerate three factors that you will keep in mind while choosing text for this presentation.
- List any four style attributes of font that can be used in this presentation.
- If you want to create an image for this presentation consisting of high rise buildings and a road scene. Which type of graphics (bitmap or vector) will be used for creating this image? Justify your answer.
- List any three visual effects that are available for transition from one slide to another.

Q2)

A school is organizing a virtual assembly.

- During the assembly, a student wants to play pre recorded piano music. Name the technique that you will use to store the piano recording. Justify your answer.
- At the end of assembly, still images of students will be displayed. Each image of the student shall contain the school building in the background. Which multimedia concept will be used to implement this?
- If the student images are to be displayed in a quick sequence, one after the other. Which technique will be used to blend and display these images smoothly? Name a software that can be used to create this.

Q3)

You are the product manager of a company. You have been given the task of creating an interactive webpage for marketing a new laptop.

- Illustrate the role of hypermedia in web page development with the help of three suitable examples.
- If you want to use a font that is not usually installed on your system, how will you resolve this issue? How is this issue handled at the user end if the user's system does not support this font?
- As a graphic designer, how will you design your own fonts for an application? Mention a tool that may be useful for this purpose.
- Mention two plug-ins for delivering video on your webpage.

Q4)

If you have a 3-D modelling program and you have to design a still image of a car using the primitive shapes.

- List four primitive shapes that can be used to create this car?
- Illustrate how each of the following techniques may be useful in designing an image of a car :
    - Extruding
    - Lathing
- Which colour model will you prefer for printing the image of the car? Justify your answer.
- Mention a popular free 3D modelling software. State one advantage and one limitation of this software.

Q5)

Consider the following scenario: a cold drink manufacturing company wants to promote their new cold drink to the general public.

- In case a promotional website is created, which software will be used by the user to open this website on his computer? How is this software different from a web server?
- In case an advertisement for radio is recorded, list any six operations to create/edit this advertisement.
- Given audio content, how does the compression of its audio file impact the audio quality?

Q6)

- Differentiate between interlacing and progressive scan.
- Name two hardware equipment and two software tools that may be useful to develop a video. Give reasons for your choice of software tools.
- A bank wants to set up a video display to showcase its schemes to prospective customers. In this scenario,
    - What kind of video display should be used? Give reasons.
    - Which authoring tool will you prefer to use? Justify your answer

Unique Paper Code	:	62343603
Name of the Course	:	B.A. (Programme) CBCS
Name of the Paper	:	Web Design Using HTML5 (SEC)
Semester	:	VI
Duration	:	3 Hour
Maximum Marks	:	75
Year of Admission	:	Admissions of 2015, 2016, 2017 & 2018

Instructions for Candidates:

All questions carry equal marks.

Attempt any FOUR questions.

1) Explain the various ways to add an image to the webpage with the help of appropriate example.
   Write an HTML program to create a webpage that includes:
   a. An inline image of our Indian flag that is stored in the folder named "C:\Document\National".
   b. A sound control that plays patriotic song in such a way that it should be compatible with different browsers. Assume that the audio files are stored in the folder named "C:\Desktop\Audio".
   c. A video control that plays "VandeMatram" song in such a way that it should be compatible with different browsers. Assume that the video files are stored in the current folder.

2) Write an HTML program that accepts the following information for Delhi University examination form from the student.

   University Roll number
   Name of the Student
   Password
   Name of the College (Assume that list of 5 DU colleges is provided)

Email
Gender (Female/Male)
Semester (1/3/5 or 2/4/6) (Consider the case of ER paper also, a student can opt for paper of two semsters)
Comments
Submit
Clear

Choose suitable controls to input the above information and Give reasons for the input type chosen for each element.

3) Explain how HTML5 overcomes the limitations of the Flash animation tool?
   Explain the various ways to add CSS to the webpage with the help of appropriate example.
   Write the code in HTML using CSS to choose the Font family as “Times New Roman” for a paragraph in such a way that the code should be compatible for all the operating systems.

4) Write HTML commands using CSS to create the following effects:
   a. A paragraph inside the box of width 150 pixels and blue solid border 2 pixels.
   b. Heading1 text should be uppercase letter and centre aligned.
   c. Heading3 of purple background colour.
   d. Indent the first line of the paragraph with 20px.
   e. Use the padding property to set the top and bottom paddings for paragraph to 25px, and left and right paddings to 50px.
   f. Delete “underline” for unvisited links, add "underline" for the hover link, set green colour for visited links and yellow background colour for active links.

5) Write an HTML program to create an employee registration webpage using HTML form elements as given below:

Employee Registration Form

Name: Enter the Name here

Password: ••••••••••••••••••

Date of Birth: dd-mm-yyyy

City: Enter City here

State: Delhi

E-mail: Enter Email here

Mobile: +91

Languages known ☐ Punjabi ☐ Hindi ☐ English

Additional information: Optional

Reset Submit

6) Write the significance of the each of the HTML line of code given below:
   a. <!--Student Enrollment Details -->
   b. h3 { color: rgba(0,0,0,.2);}
   c. background-image: url("Jasmine.gif");
   d. opacity: 0.3

Explain the various types of image formats. Which image format to be used in such a way that it should not lose the quality during resizing the photo?

Write an HTML program to create a webpage as given below. Assume that the required images are stored in the current folder.

Unique Paper Code	:	42347903
Name of the Paper	:	Internet Technologies
Name of the Course	:	B.Sc. (Programme): DSE 1B
Semester	:	VI
Year of Admission	:	2015 – 2018
Duration	:	3 Hours
Maximum Marks	:	75

Instructions for candidates: Attempt any FOUR questions out of six questions. All questions carry equal marks.

Q1. Create an HTML document having five frames as per the structure given below. `frame_2` has two links. On clicking `Link_1`, `fileForLink1.html` should be displayed in `frame_4`. On clicking `Link_2`, `fileForLink2.html` should be displayed in a new window. Also write the HTML file corresponding to `frame_2`. The file names in <…> represent the files having the default contents of the corresponding frame.

<table>
<tr><td>frame_1
<logo.jpg></td><td>frame_3
<CompanyName.html></td></tr>
<tr><td rowspan="2">frame_2
<showLinks.html>
Link_1
Link_2</td><td>frame_4
< display.html></td></tr>
<tr><td>frame_5
<contactDetails.html></td></tr>
</table>

Consider the following HTML code:

```
<html>
<head>
  <title>CSS</title>
</head>
<body>
  <h2> H2 heading.</h2>
  <p> This paragraph is normal.</p>
  <p class = "greenColor">Green paragraph</p>
  <h2 id = "italics">Italics H2 heading.</h2>
  <h2 class = "greenColor">Green H2 heading</h2>
</body>
</html>
```

Rewrite the code with CSS statements added in it, for the following:

- Background color of the webpage is yellow (an inline CSS statement)
- All the elements that belong to the `greenColor` class should be displayed in green color (an internal CSS statement)
- The element with `italics` id should be shown in italics (an internal CSS statement)
- Font size of all the paragraphs should be 10pt. (an internal CSS statement)

Q2. Create a webpage containing a textbox to read a number and a button 'Find square root'. When a user clicks on the button, a JavaScript function should do the following:

Condition to be checked	**Display in an alert dialog box if condition is true**
Input field is empty	"Enter some data"
Any non-numeric character in the data	"Only numeric data allowed"
Data is numeric but is negative	"Positive numbers only"

If the number is a positive integer, compute and display the square root of the number in an alert box.

Write the output of the following JavaScript code segment. Justify your answer.

```
var x = "5";
var y = 5;
var z = 2;
document.write((x == y) + "<br />");
document.write((x === y) + "<br />");
document.write((x + y + z) + "<br />");
document.write((z + y + x) + "<br />");
```

Given that there is a webpage containing three elements: (i) a label displaying a question: "What is the capital of India?" (ii) a text box to enter the answer of this question and (iii) a button named "Check". When a user enters the answer of the question in the text box and clicks on the button, a JavaScript function `checkAnswer` should display "Correct Answer" if the answer is correct else it should display "Incorrect Answer". The comparison should not be case sensitive. Write the code for this `checkAnswer` function.

Q3. Find the error(s) in the given Java code, correct the code and give the output of the corrected code.

```
class Main {
  public static void main(String args[]){
      rectangle r = new rectangle();
      r.area(3, 7);
    }
}
class shape {
  abstract void area(int d1, int d2);
}
class rectangle extends shape {
  void area()
    { System.out.println("Area = " + length * breadth); }
}
```

Given a scrollable `ResultSet` object `rs`, write JDBC statements to move its virtual cursor to:

- row number 25
- the first row
- two rows after the current row
- five rows previous to the the current row

Consider a table `Student(RollNo, Name, Course)`.

- Write the statement to register the JDBC driver for the database `College` having this `Student` table, with the username "root" and password "sql@123".
- Consider a stored procedure named `NoOfRows` that returns the number of students who are pursuing 'Mathematics'. The first parameter is the IN parameter and the second is the OUT parameter. Complete the following JDBC code snippet so that this stored procedure can be used:

```
statement = connect.createStatement();
_____ cstmt = connect.prepareCall("{call ____(?, ?)}");
cstmt.setString(1, ____);
cstmt.registerOutParameter(2, Types.INTEGER);
cstmt.execute();
System.out.println("No. of rows: " + cstmt.____(____));
```

Q4. Create a class `ThreeDimension` which contains private members as `x`, `y` and `z` coordinates of a 3D point. In addition define the following methods in the class:

- a parameterized constructor which initializes all the three variables by passing parameters
- a method that returns the Euclidean distance between the invoking object and another `ThreeDimension` object that is passed to it as an argument
- override `toString`() method to display the co-ordinates as a 3D point

Write the output of the following Java code. Justify your answer.

```
class A {
  private String a;
  A(String ad){
    a = ad;
  }
  void display(){
    System.out.print("\na: " + a);
  }
}

class B extends A {
  private int b;
  B(String a, int bd ){
    super(a);
    b = bd;
  }
  B(String a){
    super(a);
  }
  void displayOne(){
    System.out.print("\nb: " + b);
  }
  void displayTwo(){
    super.display();
    System.out.print("\nb: " + b);
  }
}

class Main {
  public static void main(String args[]){
    B s1 = new B("Hello");
    B s2 = new B("There", 98);
    s1.displayOne();
    s2.displayTwo();
  }
}
```

Q5. Write a JSP program using JSTL to display the following pattern for the number of rows entered by the user in a textbox (e.g. - number of rows in the example below is 3):

1
2 2
3 3 3

Complete the following JSP code snippets, such that on clicking the hyperlink `HERE`, `Second.jsp` is opened and displays the message `Hello World!!`

First.jsp

```
<%@ _________ prefix="c"
  uri = "http://java.sun.com/jsp/jstl/core" %>
<html>
<body>
<_________ var = "setVariable" value = "Hello World!!"
scope = "_________"/>
Click <a href = "_________"><b>HERE</b></a> to view
Second.jsp file.
</body>
</html>
```

Second.jsp

```
<%@ taglib _________%>
<html>
<body>
<c:out value="${sessionScope._________ }" />
</body>
</html>
```

Consider a relational schema with table `Employee(empNo, Name, Department, Salary)`. Assume data source object is set using the following statement:

```
<sql:setDataSource var="EmployeeData"
    driver="com.mysql.jdbc.Driver" url=
    "jdbc:mysql://localhost:3306/du" user="su"
    password="pwd" />
```

Write JSTL action statements for the following queries:

- Give an increment of Rs.2000/- to all the employees of the `'Sales'` department.
- Retrieve the details of all the employees of `'HR'` department.

Q6. Write an HTML code to create a form with the following elements:

Label	Name	Type
`String`	`txt1`	`Textbox`
`Start`	`txt2`	`Number`
`End`	`txt3`	`Number`
`Find Substring`	`submit`	`Submit Button`
`Reset`	`btnClear`	`Reset Button`

Write a JavaScript code that checks if entries are made in `String`, `Start` and `End`. The code should also check that `Start` should be less than `End`.

Write a JSP code that generates the substring corresponding to the data entered in the above form.

Unique Paper Code : 62341201_OC

Name of the Paper : Database Management Systems

Name of the Course : **B.A. (Prog.) Computer Applications**

Semester : II

Year of Admission : 2015, 2016, 2017 & 2018

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

Attempt any four questions. All questions carry equal marks

1. Consider the following tables:

```
Employee (E_id, Ename, City, Salary, Department,
          YearofJoining)
Project  (P_no, PName, City, DeptName, StartYear)
WorksOn  (P_no, E_id)
```

–

Identify primary and foreign keys. You may make suitable assumptions, state them, and justify your answer in light of the assumptions.

Answer the queries given below:

- Display the average salary of employees who work in the HR department.
- Display the employee name, salary and department, in increasing order of salary.
- Count the total employees working on project number 1002.
- Display the list of employees, department wise.
- For each project, retrieve the project number, department name and the number of employees working on the project.
- Increase the salary of the employees who work on more than one project by 10%. Retrieve employee ID, employee name and increased salary.

2. What is the difference between composite attribute and composite key? Give an example to show the difference.
   Discuss the role of different types of database end users.

   Given the two tables **Student** and **Course**:

Student

RollNo	**Name**	**DOB**	**Percentage**
101	Amit	12-01-1995	66
102	Sahil	22-07-1993	95
103	Payal	02-04-1995	76
104	Palak	12-05-1994	66

Course

RollNo	**CourseName**
104	Mathematics
103	Botany
102	BA Prog.

   Check if any of the constraints gets violated, if the following operations are performed on the above tables. Consider each operation independent of others and justify your answers.

   - **INSERT INTO** Student **VALUES** (101, "Rahul","10-12-1993", 81);
   - **INSERT INTO** Student **VALUES** (105, "Rahul","13-01-1994", 78);
   - **INSERT INTO** Course **VALUES** (106, "CS");
   - **DELETE FROM** Student **WHERE** DOB = "22-07-1993";

   Also add a column **Course_code** in the relation Course of integer type with **NOT NULL** constraint.

3. Consider a database **Melodies** which stores the data for a music company. Consider a scenario as follows: Each singer associated with the company has an AadharNo, name, city, and genre. Each singer can sing in any number of songs. Each song recorded at the

company has a title and an author and it can be sung by one or more than one singer. Every album that is recorded has a title, an album identifier, and is produced by one or more producers. Each producer has a unique ID and name. Design an ER diagram for the above specifications and indicate all keys and cardinality constraints, stating any assumptions that you make. Identify the degree of each relationship type in the ER schema.

4. Difference between a database schema and a database state. What is a valid state in a database?
   What is the role of database administrator (DBA) in an organization?
   Discuss three advantages of database system over traditional file system.

   Consider two tables **`Customer`** and **`Order`** given below.

`Customer`

`CustomerID`	**`Name`**	**`PhNo`**	**`DOB`**
1	Mr. John	90112342	12-11-1990
2	Ms. Bella	90324421	27-07-1989
3	Mr. Alan	90464434	03-06-1990
4	Ms. Judith	90773813	17-05-1988

`Order`

`OrderID`	**`CustomerID`**	**`Quantity`**	**`Company`**	**`AmountperQuantity`**
101	1	2	Dell	50000
101	2	3	Hp	65000
102	3	1	Hp	45000
104	1	2	Dell	57000

Write the output of the following SQL queries:

- ```
  SELECT COUNT (*)
  FROM Customer, Order
  WHERE Customer.CustomerID=Order.CustomerID
  AND Company="Dell";
  ```
- ```
  SELECT SUM(AmountperQuantity) AS Total_Amount,
  AVG(AmountperQuantity) AS Average_Amount
  FROM Order WHERE Company = "Hp";
  ```
- ```
  SELECT C.CustomerID,C.Name,C.PhNo
  FROM Customer AS C
  WHERE C.CustomerID  IN    (SELECT O.CustomerID
                             FROM Order AS O
                             WHERE Quantity>2);
  ```

5. Consider a relation **R(A, B, C, D, E, F, G, H, I, J)** and the set of functional dependencies

   F = {AB → C, A → DE, B → F, F → GH, D → IJ}.

   What is the primary key of **R**? Also give an example of a super key of **R**.

   Check whether **R** is in **2NF**. Justify your answer. Decompose the relation **R** into a set of **3NF** relations.

   What is meant by candidate key? Give an example of a relation having two candidate keys. Justify your answer.

6. Consider the following relational schema:

   Project

Field	Datatype	Constraint	Key
Pno	Int	-	Primary
Pname	Varchar(20)	NOT NULL	-
  ```

Department	Varchar(20)	NOT NULL, UNIQUE	-

Worker

Field	Datatype	Constraint	Key
UID	Varchar(20)	-	Primary
Name	Varchar(20)	NOT NULL	-
DOB	Date	NOT NULL	-
Pno	int	-	

Write SQL statements to perform the following operations in sequence:

I. Create the **Project** and **Worker** tables based on the schema given below.
II. Add a foreign key constraint on **Pno** of **Worker** to refer to the **Pno** of **Project**.
III. Change the data type of the **UID** field to integer in the **Worker** table.
IV. Illustrate the concept of insertion anomaly by adding a tuple in any of the two tables (**Project** and **Worker)**
V. Drop the foreign key constraint added in part II.

Unique Paper Code:	62343414_OC
Name of Course:	B.A. (Prog.) Computer Application (SEC)
Name of the Paper:	Search Engine Optimization OC
Semester:	IV
Duration of Examination:	3 Hours
Maximum Marks:	75 Marks
Year of Admission:	2015-2018

Instructions for Candidates:

1. Answer any **FOUR** questions out of **SIX**.
2. All questions carry equal marks.

1. You have created an e-commerce website around 10 years ago named pqr.com. Explain how the Search Engine Optimization (SEO) is changed for smooth functioning of the website in last few years? What kind of analytics will you perform to improve the ranking of your website? What is the need of an SEO expert for website? What are the parameters to improve link popularity of your website?

2. Suppose you own an e-commerce website that had ranking on SERP, but nothing appears while searching your website now. What does it mean? Why is it important to verify a website before hosting on Internet? What is the role of W3C compliance for the website and webpages? Give an example of a website, that has applied On-page SEO/Off-page SEO optimization technique. List the categories of the techniques that were used by the website. Also, suggest some improvements if required.

3. If you are the designer of a website, suggest the five most important points which you would consider for the design and layout so that your website ranks higher. What is the role of anchor text in a website? Explain with an example. Write three techniques which are considered legal and three techniques which are considered illegal by any browser in general. What is the difference between PR (page rank) and SERP (Search engine result page)?

4. What is keyword stemming and how is it important for website? Specify at least three points where you will put SEO keywords. Give an example of e-commerce website, write the domain name of that website and suggest four meta-tags we can add to improve the ranking of the website?

5. Suppose your friend owns a website and now he wants to convert it for mobile. What are the three most important tasks, which your friend should perform to make the transition smooth. Which mobile configuration will be best suitable for any website and why? What are the four common mistakes that should be avoided for mobile SEO? What are the three most important points you would suggest to your friend for title optimization?

6. Assume you have created an e-commerce website named xyz.com. Demonstrate the meta description tags, canonical tags, alt text and site map of your website with the help of appropriate example for each. Why is each one of them important for your website and search engine optimization? How can you differentiate crawling and indexing in terms of your website?

Unique Paper Code:	62343414_OC
Name of Course:	B.A. (Prog.) Computer Application (SEC)
Name of the Paper:	Search Engine Optimization OC
Semester:	IV
Duration of Examination:	3 Hours
Maximum Marks:	75 Marks
Year of Admission:	2015-2018

Instructions for Candidates:

1. Answer any **FOUR** questions out of **SIX**.
2. All questions carry equal marks.

1. You have created an e-commerce website around 10 years ago named pqr.com. Explain how the Search Engine Optimization (SEO) is changed for smooth functioning of the website in last few years? What kind of analytics will you perform to improve the ranking of your website? What is the need of an SEO expert for website? What are the parameters to improve link popularity of your website?

2. Suppose you own an e-commerce website that had ranking on SERP, but nothing appears while searching your website now. What does it mean? Why is it important to verify a website before hosting on Internet? What is the role of W3C compliance for the website and webpages? Give an example of a website, that has applied On-page SEO/Off-page SEO optimization technique. List the categories of the techniques that were used by the website. Also, suggest some improvements if required.

3. If you are the designer of a website, suggest the five most important points which you would consider for the design and layout so that your website ranks higher. What is the role of anchor text in a website? Explain with an example. Write three techniques which are considered legal and three techniques which are considered illegal by any browser in general. What is the difference between PR (page rank) and SERP (Search engine result page)?

4. What is keyword stemming and how is it important for website? Specify at least three points where you will put SEO keywords. Give an example of e-commerce website, write the domain name of that website and suggest four meta-tags we can add to improve the ranking of the website?

5. Suppose your friend owns a website and now he wants to convert it for mobile. What are the three most important tasks, which your friend should perform to make the transition smooth. Which mobile configuration will be best suitable for any website and why? What are the four common mistakes that should be avoided for mobile SEO? What are the three most important points you would suggest to your friend for title optimization?

6. Assume you have created an e-commerce website named xyz.com. Demonstrate the meta description tags, canonical tags, alt text and site map of your website with the help of appropriate example for each. Why is each one of them important for your website and search engine optimization? How can you differentiate crawling and indexing in terms of your website?

Unique paper code	:	62347626	
Name of Paper	:	Software Engineering	
Name of the Course	:	B.A. Programme: Computer Application (CBCS): DSE	
Semester	:	VI	
Duration	:	Three Hours	Maximum Marks: 75 Marks

Semester Scheme (Admissions of 2015, 2016, 2017 & 2018)

Attempt any four questions

All questions carry equal marks

Q1 TMS ltd., a software development company, develops software for various organizations. Can TMS adopt a single software life cycle model for all its software solutions? Discuss pros and cons of adopting a single software life cycle model. What are the different strategies with which we can elicit software requirement to develop software?

Q2. Rahul and Riya have an argument. Rahul feels that software engineering is same as project management but Riya disagrees with him. With whom do you agree? Justify your answer. Give possible reasons why usually cost of software increases and quality decreases during the development of software.
Suggest some ways to detect software errors in the early phases of the project when code is not yet available. Which models will you advice for the following projects? Justify your answer.

- Medicine App
- Gaming software

Q3. Why is Configuration management process needed in addition to the software development process? Describe Timeboxing software development model in your own words. What will happen to the project using Timeboxing software development model, if any one stage in iteration of the model takes longer /shorter time than its allocated time? Given an online cab booking system, list the roles and responsibilities of the reviewer and the moderator?

Q4. Design Context diagram and Level 1 Data Flow Diagrams (DFD) for a website like Aarogya Setu with the following modules

- Users can enroll
- Users can provide information about symptoms
- List of hospitals near to the user's locality
- List of testing laboratories
- List of doctors available for tele-consultation
- List of vaccination centers near to the user's locality

Also design data dictionary for the given system satisfying the above specifications. List clearly any assumptions made.

Q5. Define psychology of testing. Why should core testing members be avoided in the coding and design team? Describe various types of software testing techniques along with giving an example for each technique. List the test cases using boundary value testing for a program to compute the grade of a student pursuing B.A (prog) course. State any assumptions made. How is regression testing useful while updating software.

Q6. Can a system automatically verify completeness of a SRS document? Justify your answer. Give an example to explain inconsistent (incomplete) SRS. List the requirements activities for framing an SRS for the automation of a medical shop. Create a SRS for the same clearly defining all functional and non- functional requirements.