

University of Asia Pacific
Department of Basic Sciences and Humanities
Program: B.Sc. in CSE

Final Examination

Fall-2022

2nd year 1st Semester

Course Code: MTH 201 Course Title: Math III: Multivariable Calculus

Credit: 3.00

Time: 3.00 Hours

Full Marks: 150

Instructions:

1. There are six (6) Questions. Answer all of them. All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

- ✓ 3. What do you know about gradient, divergence and curl? Calculate the [15] CO1 work done when a force $\bar{F} = 3xy\bar{i} - y^2\bar{j}$ moves a particle in the xy -plane from $(0,0)$ to $(1, 2)$ along the parabola $y = 2x^2$.
- b. Show that the curvature of a circle of radius a is $\frac{1}{a}$. [10] CO3
- ✓ 2. a. Define Lagrange multiplier. Find the points on the sphere [12] CO1 $x^2 + y^2 + z^2 = 36$ that are closest to and farthest from $(1, 2, 2)$.
- b. Show that the function $f(x, y) = x^3 + y^3 - 63(x + y) + 12xy$ is maximum [13] CO3 at $(-7, -7)$ and minimum at $(3, 3)$.
3. a. Find the directional derivative of V^2 where $V = xy^2\bar{i} + zy^2\bar{j} + xz^2\bar{k}$ at [10] CO1 the point $(2, 0, 3)$ in the direction of the outward normal to the sphere $x^2 + y^2 + z^2 = 1$ at the point $(3, 2, 1)$.
- b. Prove that the curl of the gradient of scalar function ϕ is zero and also the [7] CO1 divergence of the curl of the vector A is zero.
- c. Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ [8] CO3 at the point $(2, -1, 2)$.
- ✓ 4. a. Let $\phi = x^2z$ and V denotes the region bounded by the plane [10] CO2 $4x + 2y + z = 8$, $x = 0$, $y = 0$, $z = 0$. Evaluate $\iiint_V \phi dV$.
- b. Evaluate the following integrals: [15] CO2

$$(i) \int_0^{\frac{\pi}{2}} \int_0^{\frac{\pi}{2}} \int_0^1 \rho^3 \sin\phi \cos\phi d\rho d\phi d\theta \quad (ii) \int_1^3 \int_x^{x^2} \int_0^{\ln z} xe^y dy dz dx$$

~~5.~~ ~~b.~~ State Green's theorem for a plane. Using Green's theorem evaluate [13] CO2
 $\oint_C (x^2 - 2xy)dx + (x^2y + 3)dy$, where C is the closed curve of the region bounded by the $y^2 = 8x$ and $x = 2$.

~~b.~~ Use the change of variables $u = x - 2y$, $v = 2x + y$ to evaluate the integral [12] CO2
 $\iint_R \left(\frac{x-2y}{2x+y} \right) dx dy$, where R is the region enclosed by the lines $x - 2y = 1$, $x - 2y = 4$, $2x + y = 1$, $2x + y = 3$.

OR

a. Use a triple integration in cylindrical coordinates to find the volume of the solid G that is bounded above the hemisphere $z = \sqrt{25 - x^2 - y^2}$, below by the xy plane and laterally by the cylinder $x^2 + y^2 = 9$. [12] CO2

b. Use Spherical coordinates to evaluate

$$\int_{-2}^2 \int_{-\sqrt{4-x^2}}^{\sqrt{4-x^2}} \int_0^{4-x^2-y^2} z^2 \sqrt{x^2 + y^2 + z^2} dz dy dx.$$

~~6.~~ ~~a.~~ State Gauss divergence theorem. Use divergence theorem to evaluate [15] CO4
 $\iint_S \underline{F} \cdot \underline{n} dS$ where $\underline{F} = 4x \mathbf{i} - 2y^2 \mathbf{j} + z^2 \mathbf{k}$ and S is the surface bounded by the region $x^2 + y^2 = 4$, $z = 0$, and $z = 3$.

b. Evaluate the integral $\iint_R \sin \theta dA$, where R is the region in the first quadrant that is outside the circle $r = 2$ and inside the cardioid $r = 2(1 + \sin \theta)$. [10] CO4

OR

~~a.~~ Using Stoke's theorem evaluate $\oint_C \underline{F} \cdot d\underline{r}$ where $\underline{F} = (x^2 + y^2) \hat{i} - 2xy \hat{j}$ [15] CO4 taken round the rectangle bounded by the lines $x = \pm a$, $y = 0$, $y = b$.

~~b.~~ Evaluate the integral $\iint_R (x^2 + y^2) dA$, where R is the region in the first quadrant bounded by the circle $x^2 + y^2 = a^2$. [10] CO4

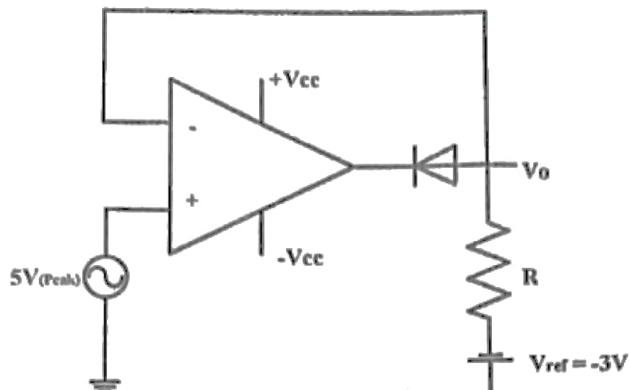
University of Asia Pacific
Department of Computer Science and Engineering
Semester Final Examination Fall - 2022
Program: B. Sc. Engineering (2nd Year / 1st Semester)

Course Title: Electrical & Electronic Engineering II Course No: EEE221 Credits: 4.00
 Time: 3.00 Hours. Full Marks: 150

[There are Eight Questions. Answer any Six including question 1 to 4. Figures in the right margin indicate marks.]

1. a. Construct the circuit for the logic function, $F = ((\bar{A} + B)C\bar{D})$ using RTL [12] and DTL design techniques.
1. b. Construct a 3-bit flash ADC and findout the digital code for the analog input voltage of 4.75V. [13]
2. a. What is back e.m.f.? Is there any relation between back e.m.f. and armature current? Why is a starter circuit required for a DC Motor? [3+3+4]
 b. A 6-pole, 440-V shunt motor has 540 lap-wound conductors. It takes 40 A from the supply mains and develops output power of 8.595 kW. The field winding takes 1 A. The armature resistance is 0.05Ω and the flux per pole is 30 mWb. Calculate (i) the speed and (ii) the gross torque developed in armature.
2 540 30 mWb
3. a. Plot the relation between armature current and output voltage of a DC generator and explain it. [10]
 b. A short-shunt compound generator delivers a load current of 30 A at 220 V, and has armature, series-field and shunt-field resistances of 0.05Ω , 0.30Ω and 200Ω respectively. Calculate the induced e.m.f. and the armature current. Allow 1.0 V per brush for contact drop. : 232.54
4. a. According to the field excitation classify DC generator and draw the equivalent circuit for each type. [12]
 b. A four-pole generator, having wave-connected armature winding has 51 slots, each slot containing 20 conductors. What will be the voltage generated in the machine when driven at 1500 rpm assuming the flux per pole to be 7.0mWb? 178.5
5. a. Develop an inverting amplifier that can amplify 5 times of the input signal. Show the input-output waveforms for your designed amplifier. Consider a 3V(peak-peak) sinusoidal as an input. [15]
 b. Show the output waveform for the following circuit. Consider a sinusoidal [10]

wave as input ($V_{peak} = 5V$) and $V_{ref} = -3V$.



OR

6. a. Develop a square wave generator circuit using 555 timer with a frequency of 5 kHz. Show the output graphically by mentioning the values of T_H and T_L . [20]
- b. Construct a voltage follower circuit and show the output waveform for a 3V (p-p) sinusoidal input. [05]
7. a. What is turn ratio of a transformer? Explain the relation between voltage ratio and turn ratio in a transformer. Explain how transformer can reduce transmission line losses. [4+4+5]
- b. A transformer has 500 turns of the primary winding and 10 turns of the secondary winding. Determine the secondary voltage if the secondary circuit is open and the primary voltage is 120 V. [12]

OR

8. a. State the applications of relay and solenoid. Explain with necessary schematic how a bipolar stepper motor can be controlled? [6+7]
- b. The number of stator teeth in a variable reluctance stepper motor is 16 and the number of rotor teeth is 8. Calculate the stepping angle of the motor. [12]

University of Asia Pacific
Department of Computer Science and Engineering
Program: B.Sc. in CSE

Final Examination

Fall-2022

2nd year 1st Semester

Course Code: CSE 203

Course Title: Object-Oriented Programming I: Java

Credit: 3

Time: 3.00 Hours.

Full Mark: 150

Instructions:

1. There are Six (6) Questions. Answer all of them. All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

1. a. Discuss the Java identifier rules with examples. [8] CO1
- b. Explain the major difference between Java arrays and C/C++ arrays. [8] CO1
- c. Describe Java Garbage Collection with examples. [9] CO1
2. a. Write a Java Program to take 5 integer inputs from the user, then sum up only the odd numbers, and then print the sum. [10] CO2
- b. Write a Java Program to take 6 integer inputs from the user, then sum up only the prime numbers, and then print the sum. [15] CO2
3. a. Create an abstract class named "Professional" and add the following to this class. [12] CO3
- i) Add 5 attributes: *name, age, specialty, designation, and salary*.
- ii) Create a constructor and pass parameters for all attributes. Inside the constructor, initialize all attributes with the parameters passed to the constructor.
- iii) Add the following methods
 - A complete/concrete method name "public void promotion(String newDesignation, double newSalary)"
- Inside the method, set the *designation* to *newDesignation* and *salary* to *newSalary* where *designation* and *salary* are the attributes whereas *newDesignation* and *newSalary* are the parameters passed to the constructor.
 - An abstract method named *jobDescription()* which does not return anything.
 - Override *toString()* method and return the concatenated value of name, age, and specialty in String format.
- b. Create a subclass of the above "Professional" class and name this class *Programmer*. [13] C
Add an additional attribute *rank*. Create constructor and pass *rank* and all attributes of parent class except *specialty*. Implement the constructor in the proper way and set the value of *specialty* to "ICT". Override the abstract method and print "Do professional programming" inside the method.

OR

[10] CO3

- a. Create an Interface named "Engine" and add the following methods.

```
void start()  
void running(int min)  
void stop()
```

- b. Create a class named "Car" using the "Engine" interface and override the necessary methods. Additionally, add 2 more attributes named *model* and *speed* and a parameterized constructor to this class. Implement the Car class in such a way that the code below shows the Expected Output shown in the right column. [15] CO3

Code (just the main method)	Expected Output
<pre>public static void main(String[] args) { Car car = new Car("Toyota Corolla", 30); /* Following line will show "Toyota Corolla started at speed=30." */ car.start(); /* Output of method call below will be Running at speed=30. Distance covered=300.*/ car.running(10); car.speed = 40; /* Output of method call below will be Running at speed=40. Distance covered=200.*/ car.running(5); // Following line will display "Stopped." car.stop(); }</pre>	Toyota Corolla started at speed=30. Running at speed=30. Distance covered=300. Running at speed=40. Distance covered=200. Stopped.

4. a. What is the output of the code on the next page if you enter the last 2 digits of your registration no, your first name, and your phone no as the 3 inputs id, name, and phNo respectively? Show the detailed steps of output calculation. [10] C

```

1 package fexam;
2
3 public class Person {
4     String name, phoneNo;
5
6     public Person(String name, String phoneNo)
7     {
8         this.name = name;
9         this.phoneNo = phoneNo;
10    }
11
12    public int findMagicNumber(int id) {
13        int index = id%11; ↳ ↳
14        char d = phoneNo.charAt(index);
15        int digit = Integer.parseInt(""+d);
16        return 2*digit;
17    }
18 }

```

```

1 package fexam;
2 import java.util.Scanner;
3
4 public class TestPerson {
5
6     public static void main(String[] args) {
7         Scanner scan = new Scanner(System.in);
8         int id = scan.nextInt();
9         String name = scan.next();
10        String phNo = scan.next();
11
12        Person p = new Person(name, phNo);
13        int output = p.findMagicNumber(id);
14        System.out.println(output);
15        scan.close();
16    }
17 }
18

```

- b. Identify the errors in the code below and fix the errors. You are not allowed to delete [15] CO4 any line of code. You can only add new lines or edit existing lines.

```

1 public class TestError {
2     public static void main(String[] a) {
3         Student st1 = new Student("Abir", "111", 3.5f);
4         Student st2 = new Student("Hasan", "111", 3.5f);
5         System.out.println(st1);
6     }
7 }
8
9 class Student {
10     private String name, id;
11     private float cgpa;
12     public final static String univName = "UAP";
13     public int studentCount = 0;
14
15     public void Student(String name, String id, float cgpa) {
16         this.name = name;
17         this.id = id;
18         this.cgpa = cgpa;
19         studentCount++;
20     }
21
22     public static void increaseStudentCount(int inc_amt) {
23         studentCount += inc_amt;
24     }
25
26     public static void setUnivName(String newName) {
27         univName = newName;
28     }
29 }
30

```

5. a. Given the following partial class "Voter", implement encapsulation for the "name" attribute and implement the read-only feature for the "age" attribute. Also, create an overloaded method of the *grow()* method.

```
public class Voter {
    private String name;
    private int age;

    public Voter(String name, int age) {
        this.name = name;
        this.age = age;
    }

    public void grow() {
        age++;
    }
}
```

- b. Carefully observe the member inner class below. Create a class with the main method. Inside the main method, do the following. [6]
- Create an object of the House class (pass parameters as needed), call the *getArea()* method, and print the output of the *getArea()* method.
 - Create an object of the Inner class Room (pass parameters as needed), call the *getArea()* method, and print the output of the *getArea()* method.

```
public class House {
    int width, length;
    int noOfRooms;
    public House(int width, int length, int noOfRooms) {
        this.width = width;
        this.length = length;
        this.noOfRooms = noOfRooms;
    }

    public int getArea() {
        return length*width;
    }

    // Inner class with 2 attributes width and length.
    public class Room{
        int width, length;
        public Room(int width, int length) {
            this.width = width;
            this.length = length;
        }

        public int getArea() {
            return length*width;
        }
    }
}
```

6. a. Create a class with multi-level try-catch i.e., nested try-catch where the exception is not handled in the inner level and handled by the outer level. [15] CO5

OR

- ✓ Create a multi-threaded program with 4 threads where each thread will add even numbers to an array. The 1st thread will add even numbers from 20 to 30, the 2nd thread from 40 to 50, the 3rd thread from 60 to 70, and the 4th thread from 80 to 90. [15] CO5

- ✓ b. Create a user-defined exception named `InvalidCgpaException` which will take 2 parameters `minCgpa` and `maxCgpa` as parameters of the constructor and set the exception message to "Valid CGPA should be between `minCgpa` and `maxCgpa`" where `minCgpa` and `maxCgpa` are the parameters. [10] CO5

OR

- Create a multi-threaded program with 3 threads where each thread will add 5 prime numbers from 50 to 80 to an array. [10] CO5

University of Asia Pacific
Department of Basic Sciences and Humanities

Program: B.Sc. in CSE

Fall-2022

2nd year 1st semester

Final Examination

Course Code: MTH 203

Course Title: Probability & Statistics

Time: 3.00 Hours

Credit: 3.00

Full Marks: 150

Instructions:

1. There are six (6) questions. Answer all of them. All questions are of equal value. Part marks are shown in the margins.
2. Non-programmable calculators are allowed.

1. a. The probability that a shooter can hit the target is 0.9. If the shooter shoots three times one after another, what is the probability that- 10 [CO1]

- (i) the shooter will have 3 successes?
- (ii) the shooter will have 1 success?
- (iii) the shooter will have no success?

b. One bag contains 4 white balls and 3 black balls, and a second bag contains 3 white balls and 5 black balls. One ball is drawn from the first bag and placed unseen in the second bag. What is the probability that a ball now drawn from the second bag is (i) black? (ii) white? 15 [CO1]

OR

a. A shipment of 20 similar laptop computers to a retail outlet contains 3 that are defective. If a school makes a random purchase of 2 of these computers, find the probability distribution for the number of defectives. 10 [CO1]

b. Consider the density function 15 [CO2]

$$f(x) = \begin{cases} k\sqrt{x}, & 0 < x < 1 \\ 0, & \text{elsewhere} \end{cases}$$

- i) evaluate the value of k .
- ii) find the cumulative distribution $F(x)$ and use it to evaluate $P(0.3 < X < 0.6)$.

2. a. The total number of hours, measured in units of 100 hours, that a family runs a vacuum cleaner over a period of one year is a continuous random variable X that has the density function 13 [CO2]

$$f(x) = \begin{cases} x, & 0 \leq x < 1 \\ 2 - x, & 1 \leq x < 2 \\ 0, & \text{elsewhere} \end{cases}$$

find the probability that over a period of one year, a family runs a vacuum cleaner (i) less than 120 hours; (ii) between 50 and 100 hours.

b. Suppose that the probabilities are 0.4, 0.3, 0.2, and 0.1, respectively, that 0, 1, 2, or 3 power failures will strike a certain subdivision in any given year. Find the mean and variance of the random variable X representing the number of power failures striking this sub-division. 12 [CO2]

OR

- a. Define expected value $E(X)$ of a random variable X . Let X be a random variable with density function 13 [CO2]

$$f(x) = \begin{cases} \frac{x^2}{3}, & -1 < x < 2 \\ 0, & \text{elsewhere} \end{cases}$$

find the expected value of $g(x) = 4x + 3$.

- b. Let X be the random variable that denotes the life in hours of a certain electronic device. The probability density function is 12 [CO2]

$$f(x) = \begin{cases} \frac{20000}{x^3}, & x > 100 \\ 0, & \text{elsewhere} \end{cases}$$

find the expected life of this type of device.

- 3.** a. Show that the mean and variance of the binomial distribution $b(x; n, p)$ 15 [CO3] are $\mu = np$ and $\sigma^2 = npq$.

- b. The mean of a binomial distribution is 40 and standard deviation 6. 10 [CO3] Calculate n, p, q .

- 4.** a. A workshop produces 2000 units per day. The average weight of units is 130 kg with standard deviation of 10 kg. Assuming normal distribution, 12 [CO3] how many units are expected to weigh less than 142 kg?

- b. An electrical firm manufactures light bulbs that have a life, before burn-out, that is normally distributed with mean equal to 800 hours and a standard deviation of 40 hours. Find the probability that a bulb burns between 778 and 834 hours. 13 [CO3]

- 5.** a. The mean lifetime of a sample of 100 light tube produced by a company 10 [CO4] is found to be 1580 hours with standard deviation of 90 hours. Test the hypothesis that the mean lifetime of the tubes produced by the company is 1600 hours. [Use 5 % level of significance]

- b. You are working as a purchase manager of a company. The following information has been supplied to you by two manufacturers of electric bulbs. 15 [CO4]

	Company A	Company B
Mean life (in hours):	1300	1288
Standard deviation (in hours):	82	93
Sample size:	100	100

Which brand of bulbs are you going to purchase if your desire is to take a risk of 5%?

6. A researcher wanted to study the relationship between gender and owning cell phones. She took a sample of 2000 adults and obtained the information given in the following table. 25 [CO4]

	Own Cell Phones	Do Not Own Cell Phones
Men	640	450
Women	440	470

At the 5% level of significance, can you conclude that gender and owning a cell phone are related for all adults?

Table 1: Area under the Standard Normal curve from 0 to z

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4990	0.4990	0.4990

Table 2: The Chi-Square Distribution

Degrees of freedom	α									
	0.995	0.99	0.975	0.95	0.90	0.10	0.05	0.025	0.01	0.005
1	--	--	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.070	12.833	15.086	16.750
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
15	4.601	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801
20	7.434	8.260	9.591	10.851	12.443	28.412	31.410	34.170	37.566	39.997

University of Asia Pacific
Department of Computer Science and Engineering
Program: B.Sc. in CSE

Final Examination

Fall-2022

1st year 2nd Semester

Course Code: CSE 205

Course Title: Data Structure

Credit: 3.0

Time: 3.00 Hours.

Full Mark: 150

Instructions:

1. Answer Q1, Q2, Q3, Q4, Q5 or Q6, Q7 or Q8. Marks are shown in the margins.
2. Non-programmable calculators are allowed.

- ✓ a. "The worst time complexity to delete an array element is O(n)." - Justify the statement [5] with necessary examples.
- b. Suppose you have been given an array of 8 elements which contains YOUR_BIRTHDAY [20] as sequential digits in DD/MM/YYYY format. Your task is to print the array after removing all the duplicate elements from the array.

For instance, Student A's birthday is 17/08/1992, then the input array will have, {1, 7, 0, 8, 1, 9, 9, 2} the output array will have the following data: {7, 0, 8, 2}. Now you need to write a pseudo code to solve this problem along with necessary iterations.

- ✓ a. You have read two different searching algorithms namely - binary search and interpolation search this semester. In general case we know that, interpolation search works better than the binary search. Can you provide any scenario where interpolation search may not work as good as binary search and needs more iterations? If yes, please state the scenario with necessary simulation. [10]
- b. You are a lead programmer of X software company in the data management division. [15] You are responsible for sorting 2.0 GB of banking data with 200 MB at hand main memory.
According to your preferred sorting algorithm, sort the following data in increasing order and show the sorting steps in detail.

39, 0, 44, 5, 70, 10, -66

- ✓ a. Describe some advantages of Postfix expression over the Infix expression. [5]
- b. Using Stack data structure convert the following expression from Infix to Postfix and [20] show the conversion steps in details:
$$K + L - M * N + (O^P+Z) * W/U/V * T + Q$$

- ✓ a. Why is recursion important in Data structure? Write some examples on it. [5]
- b. Develop the following series using recursion: 0 1 2 4 8 15 28 and so on. Consider [20] three initial values (0, 1, 2).

5. a. Write the cases where using arrays provides advantages instead of linked lists. [5]
- b. Given a linked list and two integers m and k . Write a pseudocode/algorithm along with necessary simulation that [20]
- First insert a node with the item value m at the beginning of the list,
 - Then delete the last k nodes from the linked list.

OR

6. a. Write the cases where using a linked list provides advantages instead of arrays. [5]
- b. Given a linked list and two integers m and k . Write a pseudocode/algorithm along with necessary simulation that [20]
- First insert a node with the item value m at the end of the list,
 - Then delete the first k nodes from the linked list.

7. A person, Gayle, wants to go to a picnic with all of his friends of his French Learning Class. He first wants to share his plan with his closest friends, those are directly connected with him and has the minimum distance from Gayle- Audrey, Bill and Cathey. Then those friends will share the plan to their closer ones respectively and so on. [20+5 =25]
- What is the most suitable graph traversing algorithm that can be used in this case? According to your answer show the traversing steps on the graph of Figure 1 in details.
 - What type of Data Structure (Stack/Queue) will be appropriate for implementing this traversal algorithm? Explain with proper reasons.

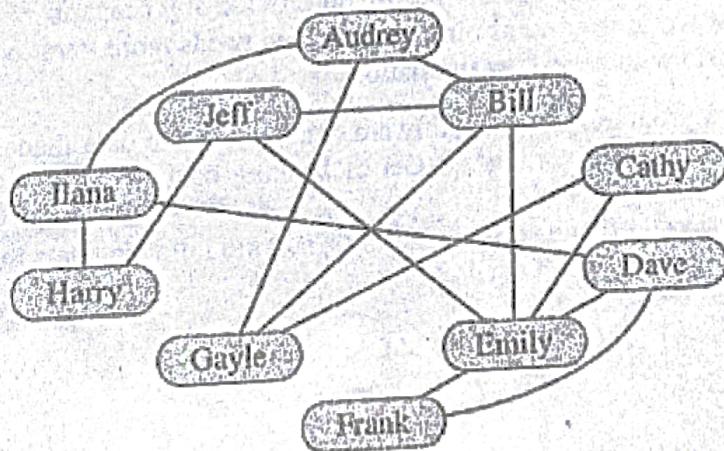


Figure 1

OR

8. A person wants to visit some places. He starts from a vertex and then wants to visit every vertex till it has no unvisited adjacent vertex. After that, it goes back and explores other vertex from the same vertex. What is the most suitable graph traversing algorithm that should be used? [20+5 =25]

- According to your answer show the traversing steps on the following graph Figure 2 where you have the freedom to choose any vertex as the starting vertex.

ii. What type of Data Structure (Stack/Queue) will be appropriate for implementing this traversal algorithm? Explain with proper reasons.

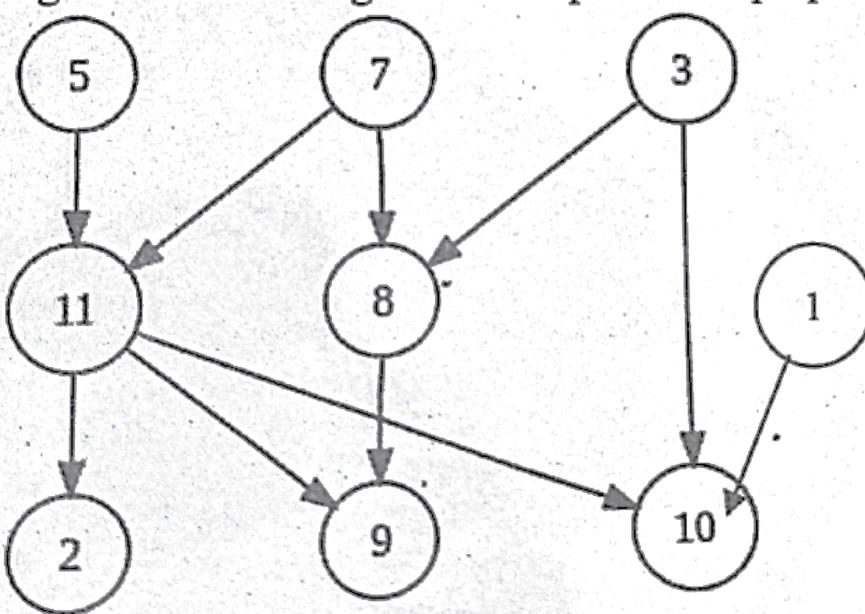


Figure 2