University of Asia Pacific
Department of Basic Sciences & Humanities
Mid-Semester Examination, Spring -2022
Program: B.Sc. in Computer Science and Engineering (2nd year/2nd semester)

Course Title: Probability and Statistics
Credit: 3.00
Time: 1.00 Hour
Course Code: MTH 203
Full Marks: 60

There are **Four (4)** questions. **1 and 2** are mandatory and answer **any one (1) from 3 and 4.**
All questions are of equal value. Part marks are shown in the margins.

1. (a) A factory produces a certain type of outputs by three types of machines. The respective daily production figures are: **10**

Machine 1: 350 units Machine 2: 285 units Machine 3: 495 units

Past experience shows that, 12.12% of the output produced by Machine 1 is defective. The corresponding fractions of defectives for the other two machines are 15.68% and 23.85% respectively. An item is drawn at random from the day's production and is found to be defective. What is the probability that it comes from the output of Machine 2?

(b) In a class, 40.037% of the students study math and science. Rest of the students study math. What is the probability of a student studying science given he/she is already studying math? **5**

(c) A class consists of 120 students. 40 of them are girls and 80 boys. 35 of them are rich and remaining poor. 15 of them are fair complexioned. What is the probability of selecting a fair complexioned rich girl? **5**

2. (a) A random draw of two balls are made from an urn containing 12 red, 7 blue and 7 white balls. Find the probability that, **10**

(i) the balls are of the same colors
(ii) the balls are of different colors

(b) **(a)** Two dice are rolled, find the probability that the sum is **10**

(i) greater equal to 9
(ii) less than 7

3. (a) Calculate the arithmetic mean and median of the frequency distribution given below. Hence calculate the mode using empirical relation between them. **12**

Sales	51-55	56-60	61-65	66-70	71-75	76-80	81-85
No. of companies	13.23	17.27	27.22	29.34	28.41	32.56	19.76

(b) Find Third quartile Q_3 for the given data in (a). 8

OR

4. (a) Calculate the arithmetic mean and median of the frequency distribution given below. Hence calculate the mode using empirical relation between them. 12

Sales	51-55	56-60	61-65	66-70	71-75	76-80	81-85
No. of companies	13.23	17.27	27.22	29.34	28.41	32.56	19.76

(b) Find first quartile Q_1 for the given data in (a). 8

University of Asia Pacific

Department of Computer Science & Engineering

Mid-Semester Examination Spring-2022

Program: B. Sc Engineering (2nd Year/ 1st Semester)

Course Title: Data Structures Course No. CSE 205 Credit: 3.00

Time: 1.00 Hours. Full Mark: 60

There are **Three** Questions. Answer **all** of them. All questions are of equal value/Figures in the right margin indicate marks.

1. UAP appreciates the meritorious students, thus it provides scholarships to those who got GPA minimum 3.5 and above in previous semester. Now you are being asked to make a list of those students who are eligible for merit scholarship in entire UAP in Spring 2022.

   a) Which data structure you will choose and why? 5

   b) Write the necessary pseudo code to manage this list. Show necessary block diagrams and perform some iterations on a sample dataset of at least 10. 15

2. a) What are the applications of linked list in real world? 5

   b) Suppose you have been given an array of 8 elements which contains YOUR_UAP_ID as sequential digits in an array. Your task is to insert the array into a linked list. Now you need to write a pseudo code to solve this problem along with necessary iterations. Example- if YOUR_UAP_ID is '21101001' then you need to insert {2, 1, 1, 0, 1, 0, 0, 1} into the linked list. 15

3. a) Define 'PUSH' operation in Stack. Give necessary example. 5

   b) Design a stack using array cells of size 5 then show 'POP' operations with necessary pseudo code and diagram. 15

Or

a) Define 'ENQUEUE' operation in Queue. Give necessary example. 5

b) Design a queue using array cells of size 5 then show 'DEQUEUE' operations with necessary pseudo code and diagram. 15

University of Asia Pacific
Department of Basic Sciences & Humanities
Mid-Semester Examination, Spring -2022
Program: B.Sc. in Computer Science and Engineering (2nd year/1st semester)

Course Title: Multivariable Calculus
Credit: 3.00
Time: 1.00 Hour
Course Code: MTH 201
Full Marks: 60

There are **FOUR** questions. Answer **THREE** questions including **Question 1 and 2**. Figures given in the right margin indicate the marks of the respective questions.

1. (a) Define continuity and differentiability of a function of two variables. Evaluate the limit by converting to polar coordinates, $\lim_{(x,y)\to(0,0)}\left(x^2+y^2\right)\ln\left(x^2+y^2\right)$. **10**

(b) Define arc length and hence find the arc length of the curve **10**

$$\underline{r}(t)=e^t\cos t\,\underline{i}+e^t\sin t\,\underline{j}+e^t\,\underline{k} \text{ for } 0\le t\le\frac{\pi}{2}$$

2. (a) Define vector valued functions. Find the unit tangent vector and unit normal vector for the helix $x=2\cos t,\quad y=2\sin t,\quad z=4t$ at $t=\frac{\pi}{4}$. **10**

(b) Suppose that a particle moves through 3-space so that its position vector at time t is $\underline{r}(t)=(t+3)\underline{i}+t^3\,\underline{j}+t^4\,\underline{k}$. (i) Find the scalar tangential and normal components of acceleration at $t=2$. (ii) Find the vector tangential and normal components of acceleration at $t=2$. **10**

3. (a) What do you know about gradient, divergence and curl? Find the directional derivatives of $\phi=4xz^3-3x^2y^2z$ at $(2,-1,2)$ in the direction $2\mathbf{i}-3\mathbf{j}+6\mathbf{k}$. **10**

(b) Prove that the curl of the gradient of scalar function ϕ is zero and also the divergence of the vector **A** is zero. **10**

OR

4. (a) Find parametric equations of tangent line to the curve whose parametric equations are $x=t^3,\ y=t^4-t^2,\ z=-5t^2$ at $t=2$. **10**

(b) Define curvature of a curve. Find the curvature of the curve $\underline{r}(t)=e^t\,\underline{i}+e^{-t}\,\underline{j}+t\,\underline{k}$ at $t=0$. **10**

University of Asia Pacific
Department of Computer Science & Engineering
Mid-Semester Examination, Spring-2022
Program: B. Sc. Engineering (2nd Year / 1st Semester)

Course Title: Electrical Electronic Engineering II Course Code: EEE 221 Credit: 4.00
Time: 1.00 Hour Full Marks: 60

[Answer all **Three** questions. Figures in the right margin indicate marks.]

1. (a) Draw the equivalent circuits for short shunt and long shunt compound generator. Explain the load characteristics of a DC shunt generator. [6+4]

(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 0.05 Ω, 0.30 Ω and 200 Ω respectively. Calculate the induced e.m.f. and the armature current. Allow 1.0 V per brush for contact drop. [10]

2. (a) Explain different types of speed control technique of a DC motor. Briefly explain why a starter circuit is required for a DC Motor. [6+4]

(b) A 4-pole, 220-V shunt motor has 540 lap-wound conductors. It takes 32 A from the supply mains and develops output power of 5.595 kW. The field winding takes 1 A. The armature resistance is 0.09 Ω and the flux per pole is 30 mWb. Calculate (i) the speed and (ii) the gross torque developed in armature. [10]

3. (a) Define transformer. Why is laminated core used in a transformer? Explain how transformer can reduce transmission losses in power system. [2+3+5]

(b) Calculate the turn ration and voltage output of the secondary winding of a transformer if the primary voltage is 35 volts, the secondary winding has 4500 turns, and the primary winding has 355 turns. [10]

OR

What are the different types of losses involved in electrical machines? How these losses can be minimized? [10+10]

University of Asia Pacific

Department of Computer Science and Engineering

Mid-Semester Examination Spring-2022

Program: B.Sc. in CSE

Course Title: Object Oriented Programming I: Java Course No. CSE 203 Credit: 3

Time: 1.00 Hour. Full Mark: 60

There are **Four** Questions. **Answer three questions including Q-3 and Q-4.**

1. a. Define a class and name it as "**ICPCCoach**". Add the following inside the class. **[12]**

i. Declare 3 instance variables ***name, country, teamCount***

ii. Add a parameterized **constructor** which will take 3 parameters. Inside the constructor initializes the attributes with the parameters passed to the constructor.

iii. Add the following methods.

a. public void promoteTeam(String ***teamName***)
– Inside the method, increase the ***teamCount*** by 1 and print "***teamName*** under ***name*** has been promoted for Final contest." Here ***teamName*** is the value of the parameter passed to the method whereas ***teamCount*** and ***name*** are the values of respective attributes.

b. public int getTeamCount()
– the method should return the ***teamCount*** attribute.

c. public void display()
– inside the method, print the values of all three attributes.

b. Define a class and name it as "**ICPCContest**". Declare the **main** method inside the class. Inside the main, do the following. **[8]**

i. Create an object of **ICPCCoach** class with *name*=your name, *country* = "Bangladesh", and ***teamCount*** =2. Store the reference of the object to ***coach*** variable.

ii. Call the ***promoteTeam*(...)** method using the ***coach*** variable and pass "UAP Fighter" as the parameter of the method.

iii. Call the **display()** method using the ***coach*** variable.

- What is the output of this method?

OR

[12]

2. a. Define a class named "**Rectangle**". Add the following inside the class.
   1. Declare 2 **private** instance variables ***length*** and ***width.***
   2. Add a parameterized **constructor** which will take 2 parameters. Inside the constructor initializes the attributes with the parameters passed to the constructor.
   3. Add the following methods.
      a. public double getArea()
         – Inside the method, calculate the area of the rectangle and return the area.
      b. public void display()
         – inside the method, print the value of all three attributes.
      c. Add **getter/setter** method for the 2 attributes.

[8]

b. Define a class named **Box** and make it the subclass of **Rectangle** (Q#2.a.) class. Add an additional attribute ***height*** to this subclass. Add a parameterized constructor which will take 3 parameters for ***length, width*** and ***height***. Inside the constructor, initialize the attributes in proper way. Add a method "***public double getVolume()***" and return the volume of the box from the method.

[10]

3. a. Write short notes on the following.
   i. Inheritance
   ii. Encapsulation

[10]

b. Write a java program that will take 3 integers as input and print the square of the highest number among these 3 numbers.

[10]

4. a. What will be **output** of the code below? Explain the steps for output calculation in details.

MidExam.java

```
1  package mid;
2
3  public class MidExam {
4      private int noOfQuest;
5      double score, totalScore;
6      static String semester = "2-1";
7
8      public MidExam(int noOfQuestion, double totalScore, double score) {
9          this.noOfQuest = noOfQuestion;
10         this.totalScore = totalScore;
11         this.score = score;
12     }
13
14     public void addScore(double score) {
15         if(this.score + score<=totalScore)
16             this.score += score;
17         else
18             System.out.println("invalid score");
19     }
20
21     public void display() {
22         String d=String.format("%s-%d-%.1f-%.1f", semester, noOfQuest, totalScore, score);
23         System.out.println(d);
24     }
25 }
```

FindOutput.java

```
1  package mid;
2
3  public class FindOutput {
4
5      public static void main(String[] args) {
6          MidExam a = new MidExam(5, 100, 10);
7          MidExam b = new MidExam(5, 80, 20);
8          a.addScore(5);
9
10         midFun(a, b);
11         a.display();
12         b.display();
13     }
14
15     public static void midFun(MidExam m1, MidExam m2) {
16         m1.totalScore = m2.totalScore;
17         m2 = new MidExam(5,60,30);
18         m2.semester="2-2";
19         m2.score = m1.score;
20     }
21
22 }
23
```

5 80 10
80 5 60 20 10

b. Identify the **errors** in the code below and fix the errors. You **are not allowed to delete** any line of code. You can **only add new line** or edit existing line. **[10]**

MidExam.java

```
1  package mid;
2
3  public class MidExam {
4      private int noOfQ;
5      double score, tScore;
6      public static String semester = "2-1";
7
8      public MidExam(int noOfQuestion, double totalScore, double score) {
9          this.noOfQ = noOfQuestion;
10         this.tScore = totalScore;
11         this.score = score;
12     }
13
14     public void addScore(double score) {
15         if(this.score + score<=tScore)
16             this.score += score;
17         else
18             System.out.println("invalid score");
19     }
20
21     public void display() {
22         String d=String.format("%s-%d-%.1f-%.1f", semester, noOfQ, tScore, score);
23         System.out.println(d);
24     }
25 }
```

FindError.java

```
1  package mid.test;
2
3
4  public class FindError {
5
6      public static void main(String[] args) {
7          MidExam m1 = new MidExam(10, 100);
8          m1.addScore(10);
9
10
11         System.out.println(m1.noOfQ);
12         System.out.println(MidExam.tScore);
13         System.out.println(MidExam.semester);
14
15
16     }
17
18 }
```