Bangabandhu Sheikh Mujibur Rahman Science and Technology University

Department of Computer Science and Engineering

2nd Year 1st Semester B.Sc. Engineering Examination-2019

Course Code: CSE205 **Course Title: Java Technology**

Total Marks: 60 **Time: 3 (Three) Hours**

N.B.

i) Answer **SIX** questions out of the following **EIGHT** questions. ii) All questions are of equal values.

1. (a) Write Java code that creates five threads, each is started after initialization. When they run, a common variable 'counter' gets incremented. If it becomes greater than equal to 1000, each thread stops. **3**

(b) What are the differences between default constructor and user defined constructor. Explain with examples. **3**

(c) Explain the five phases of Java Development Environment. **4**

2. (a) Explain what happens when we declare a method as static, abstract, final separately and a method as abstract and static simultaneously. **3**

(b) What is constructor chaining in Java? Write down the output of the following program: **3**

```
public class Vehicle {
    int noOfWheel;
    double speed;
    public Vehicle(String type, int n, double s){
        noOfWheel = n;
        speed = s;
        System.out.println("It is a "+type+" with speed:
"+speed);}
    public Vehicle(int n, double s){
        noOfWheel = n;
        speed = s;
        System.out.println("Its speed is: "+speed);}
}
public class Car extends Vehicle{
    String model;
    double power;
    public Car(int n, double p, String m){
        super(n, p*20);
        power = p;
        model = m;
        System.out.println("Its model is: "+model+" with wheels:
"+noOfWheel+" and power : "+power);}
}
public class Test {
    public static void main(String[] args){
        Vehicle bicycle = new Vehicle("Bicycle", 2, 30);
        Car c = new Car(4, 82, "Ford");
    }
}
```

(c) What is an applet? Write down the life cycle of an applet. **2**

(d) What are the roles of JVM and JIT? **2**

3. (a) A consultant contains all the properties of a person but a few properties of an engineer. Declare a person class that contains hasName(), hasAge(), hasAddress() and an engineer class that contains hasQuality(), hasFieldWork(). A consultant inherits everything of a person but only the quality of an engineer. Implement this phenomenon in Java code. **N.B.** person and engineer are such classes whose instances are not possible. **4**

(b) Explain early binding and late binding with examples. **3**

(c) What do you understand by Java String Pool? **1**

(d) What is multiple inheritance? Is it supported by Java? **2**

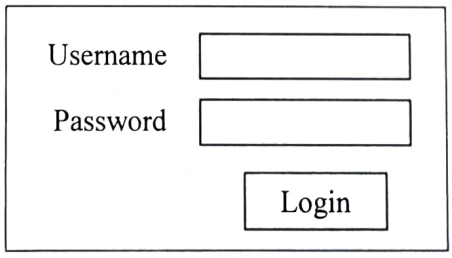
4. (a) What is the use of *synchronized* keyword in Java? "If a thread calls the method *wait()* , it can never be alive again". Justify this statement. **2**

(b) Explain different types of exceptions. Rewrite the following code which can handle the possible exceptions. **2+3**

```
public class Test {
    public static void main(String[] args){
        String str = null;
        int a[] = {5, 2, 3, 9, 6}, b = 0;
        if(str.matches("Divide")){
           for(int i=1; i<=5; i++){
               System.out.println(a[i]/b);
               b = a[i] - b;
           }
        }
    }
}
```

(c) Create a class **MyClass** which implements *Runnable* interface. When an object of **MyClass** is created, it will print from 1 to 20 with an interval of 1 second. **3**

5. (a) Create a frame of size 400X400 and it contains two labels, two textFields and a button as shown below: **5**



(b) How can you make an object eligible for Garbage Collector in Java? **2**

(c) What do you mean by race condition? How can this be avoided in java program? **2**

(d) What is use of *finalize()* method in Java? **1**

6. (a) A number and a string are taken as input from the console. You are asked to show one error message if the number is not in between 20 and 100 and another error message if the string does not contain any capital letter. Create your own exception class/classes. **5**

(b) What are the differences between *wait()* and *sleep()* methods? What is the use of *notify()* method? 2+1

(c) Why cannot static methods access non-static variables or methods? 2

7. (a) Consider a class Student like the following: 4

```
class Student {
        int id;
        String name;
        int age;
}
```

Define a method boolean equalsTo(Object obj) in the class Student which returns a boolean value. For example:

```
Student s1 = new Student(1, "Aaa", 20);
Student s2 = new Student (2, "Bbb", 21);
Student s3 = new Student (3, "Ccc", 23);
Student s4 = new Student (4, "Bbb", 21);
s1.equalsTo(s2); // returns false
s1.equalsTo(s3); // returns false
s2.equalsTo(s4); // returns true
```

(b) Write a class Student that has name and age as member variables. Create four objects of this class and add them to an ArrayList. Print out the name of that student who is the oldest. 4

(c) Write short note on constructor chaining in Java. What is the output in the following program: 2

```
public class Person {
    String name;
    public Person(String n){
        name = n;
        System.out.println("The name of the person is: "+name);
    }
}
public class Student extends Person{
    public Student(String n){
        super(n);
        System.out.println("The name of the student is: "+name);
    }
}
public class Test {
    public static void main(String[] args){
        Student s1 = new Student("XYZ");
        Person p1 = new Person("PQR");
    }
}
```

8. (a) Consider the following code snippet: **4**

```
public class Main{
    public static void main(String[] agrs){
        int a = calculate("sS", 6, 4, 3);  //a = 6+4-3 = 7
        int b = calculate ("Ss", a, 4, 7);  //b = a-4+7 = 10
        int c = calculate ("Sm", b, a, 3);  //c = (b-a)*3 = 9
        int d = calculate ("ds", c, 3, -3);  //d = (c/3)+(-3) = 0
    }
}
```

Write the Java method 'calculate' in the appropriate way. You can write only one 'calculate' method.

(b) Suppose a file 'test1.txt' is located in "C:/Desktop". Create another file 'test2.txt' in "C:/Desktop" containing all in 'test1.txt' except the spaces being replaced by commas. **N.B.** consecutive spaces must be replaced by a single comma. **4**

(c) What is socket programming? Write down its uses. What does a socket consist of? **2**

Bangabandhu Sheikh Mujibur Rahman Science and Technology University

Department of Computer Science and Engineering

2nd Year 1st Semester B.Sc. Engineering Examination-2019

Course Code: MAT205 **Course Title: Vector, Matrix & Fourier Analysis**

Total Marks: 60 **Time: 3 (Three) Hours**

N.B.

i) Answer **SIX** questions out of the following **EIGHT** questions. ii) All questions are of equal values.

1. a) Define inverse matrix. Using row operation find the inverse of **5**

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 5 & 3 \\ 1 & 0 & 8 \end{pmatrix}$$

b) Write down the elementary row operation method. Solve the following equations by using matrix method **5**

$$3x - y + 5z = 1$$
$$2y - 4z = 2$$
$$6x - y + 3z = 0$$

2. a) Prove that every square matrix can be uniquely expressed as the sum of a symmetric matrix and a skew symmetric matrix **4**

b) Define rank of a matrix. Find the rank of the matrix **6**

$$B = \begin{bmatrix} 1 & 3 & 1 & 1 \\ 2 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

3. a) Define Fourier Transform. Find the Fourier *cosine* transform of e^{-x^2} **4**

b) Determine the perseval's identity for Fourier Transform. **3**

c) State and prove the Modulation theorem. **3**

4. a) Explain half range Fourier *sine* & *cosine* series. Expand $f(x) = x^2$, $0 < x < 2\pi$ in Fourier series if the period is 2π. **5**

b) Find the Fourier coefficients and corresponding Fourier series for the function **5**

$$F(x) = \begin{cases} 0, & -5 < x < 0 \\ 3, & 0 < x < 5 \end{cases}$$

5. a) Define linear dependent of vectors. Find the equation for the plane determined by the points **4**

$P_1(2, -1, 1)$, $P_2(3, 2, -1)$, $P_3(-1, 3, 2)$

b) Define curl of a vector. Prove that, $\nabla^2\left(\frac{1}{|r|}\right) = 0$ **6**

6. a) Prove that $\nabla \times (\nabla \times \mathbf{A}) = -\nabla^2 A + \nabla(\nabla . \mathbf{A})$ **5**

b) Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at the point (2, -1, 2). **5**

7. a) Define unit vector. Find the area of a parallelogram having the diagonal $\boldsymbol{A} = 3\hat{\imath} + \hat{\jmath} - 2\hat{k}$ and $\boldsymbol{B} = \hat{\imath} - 3\hat{\jmath} + 4\hat{k}$. **5**

b) Define line integral. Find an equation for the tangent plane to the surface $z = x^2 + y^2$ at the point (1, -1, 2). **5**

8. a) State and prove Green's theorem in plane. **5**

b) Suppose $\mathbf{F} = y\hat{\imath} + (x - 2xz)\hat{\jmath} - xy\hat{k}$. Evaluate $\iint_S (\nabla \times \mathbf{F}).\mathbf{n}ds$, where S is the surface of the sphere $x^2 + y^2 + z^2 = a^2$ above the xy-plane. **5**

Bangabandhu Sheikh Mujibur Rahman Science and Technology University
Department of Computer Science & Engineering
2th Year 1st Semester B.Sc. Engineering Examination-2019

Course Title: Applied Statistics and Queuing Theory **Course Code: STA205**

Full Marks: 60+10 **Time: 3(Three) Hours**

[Answer any **SIX** questions; Digits of the right side indicate marks.]

Q.1 (a) What is frequency distribution? What are the ways of representing statistical data graphically? Describe some of them. 3

(b) What are the necessities of summarizing a dataset? The following data represents the prices of different items which were sold in last month. 1+3

Items	Prices (TK in lakhs)
Desktop	1000
Laptop	1580
Keyboard	563
UPS	460
CPU	380

Draw an appropriate diagram for the given dataset.

(c) Write down the type of data and scale of measurement for the following variables:(i) number of customers entering the bank everyday, (ii) religion, (iii) prices of different electronic components, (iv) position in a game(first, second and third), (v) temperature (^{0}C), (vi) number of computer programming known by a student. 3+1

Q.2 (a) What is generalized basic principle of counting? Prove that where A and B are any events. In a group of students, 40% student took Math, 30% took Stat and 20% took both. What number of students took (i) Either Math or Stat? (ii) Neither Math nor Stat? 7

(b) In a community 20% families have cars, 20% have washing machine and 15% have both. Does having a washing machine depend on having a car? 3+1

Q.3 (a) The data below specify the age of 52 employees in a government agency: 6

Ages (in years)	25.5-31.5	31.5-37.5	37.5-43.5	43.5-49.5	49.5-55.5	55.5-61.5
Frequency	7	17	11	8	5	4

Calculate the mean and median age for the following data. Also, calculate variance of the given dataset.

(b) In usual notation show that. Consider 5 numbers. Suppose the mean of 4 numbers is 14. If 5th number is 24. What is the mean of all 5 numbers? 4+1

Q.4 (a) What do you mean by correlation analysis? Plot when the correlation co-efficient (i) r= very close to +1, (ii) r=very close to -1, (iii) r= very close to 0, (iv) negative but very close to zero. 3

(b) Suppose that it is desired to determine the relationship between the length of sales of experience and the volume of sales for each salesman from the group of 10 salesmen of an insurance company. Years of experience and sales volume are shown below: 2+3+3

Sales experience (in years)	1	3	4	4	6	8	10	10	11	13
Volume of sales (in TK. '000)	80	97	92	102	103	111	119	123	117	136

i. Plot a scatter diagram of these data and interpret.
ii. Fit a regression line and interpret the parameters.

iii. Find the predicted sales volume when the sales experience is 15 years and interpret your result.

Q.5 (a) Define random experiment, sample space, mutually exclusive events, and collectively exhaustive events with examples, what are the axioms of probability? 6·67

(b) In a factory, 3 machines produce disks. Machine-1 produces 30%, Machine-2 produces 40%, and Machine-3 produces the remaining 30% of the disks. Also 9% of the disks produced by Machine-1, 4% of Machine -2, and 12% of Machine-3 are defective. A disk is randomly taken from the mixed lot. 4+1

i. What is the probability that the disk is defective?
ii. If the disk is defective, what is the probability that it is produced by Machine-3.

Q.6 (a) Prove that for any two event E and F, $P(E \cup F)=P(E)+P(F)- P(E \cap F)$. 3+1

(b) Define random variable, probability mass function (pmf), and cumulative distribution function (cdf). 3·67

(c) Define Poisson distribution. The number of demands for CPU to an IT firm follows Poisson distribution with on average 4 demands every 15 minutes. Find the probabilities of 4

i. Fewer that two demands in 15 minutes
ii. At least 2 demand in 30 minutes.
iii. Four demand in 4 hours.

Q.7 (a) 6+1

Suppose X has pdf: $f(x)=\begin{cases} k(1 - x^3), -1 < x < 1 \\ 0, \text{otherwise} \end{cases}$

Find

i. The value of k
ii. $P(-0.5 < X < 0.50)$
iii. $P(X = -0.4)$
iv. The cdf
v. E(X)
vi. Var(X).

(b) If the random variable X~Bernoulli (p), then find the E(X) and Var(X). 4·67

Q.8 (a) An MCQ test has 12 questions each with 4 possible answers. A student chooses all the answers randomly. What is the probability that he will answer 4+1

i. 8 questions correctly
ii. At least 2 questions correctly?

(b) Define Poisson random variables and give some examples. The average number of calls received by a telephone operator during a time interval of 10 minutes during 5 p.m. to 5:10 p.m. daily is 3. What is the probability that the operator will receive 2+4·67

i. No calls
ii. At least two calls tomorrow during the same interval?

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Department of Computer Science & Engineering

Course Code: CSE203 **Course Title:** Digital Logic Design
Total Marks: 60 **Time:** 3 Hours

N.B. (i) Answer **SIX** questions, taking any **EIGHT**.

1. (a) What is logic gate? How can we represent the gates by truth table? What is don't care condition? 4
   (b) What is the significance of universal gate? Explain with a Boolean expression. 2
   (c) What is the general technique for converting a decimal number to 2's complement representation? Use 2's complement to perform M-N with the given binary numbers 4
      i. M= 1000100 & N= 1010100
      ii. M= 01001100 & N= 00110011

2. (a) What is the difference between canonical form and standard form? Which form is preferable when implementing a Boolean function with gates? 3
   (b) Convert the following expression to product of sum canonical form. 3
      $F(A, B, C, D) = \sum(0,2,6,11,13,14)$
   (c) Obtain the simplified expression by using tabulation method for the following Boolean expression: 4
   $F = a\bar{b}\bar{c}\bar{d} + \bar{a}\bar{b}\bar{c}\bar{d} + \bar{a}\bar{b}\bar{c}d + \bar{a}\bar{b}c\bar{d} + a\bar{b}c\bar{d} + a\bar{b}cd + abc\bar{d} + abcd$

3. (a) What is tri-state logic? 2
   (b) Simplify the following function using K map and draw its equivalent circuit. 5
      $F(A,B,C,D) = \Pi(1,3,5,7,9,11,13,15)$
   (c) Simplify the Boolean Function: 3
   $F = \bar{B}\bar{C}\bar{D} + B\bar{C}\bar{D} + AB\bar{C}\bar{D}$
   $d = \bar{B}\bar{C}\bar{D} + \bar{A}B\bar{C}\bar{D}$

4. (a) Describe Octal to binary encoder. 4
   (b) What is Full-Subtractor? Implement Full-Subtractor with truth table and circuit diagram. 4
   (c) What is BCD code? 2

5. (a) Describe Open collector output and Totem-pole. 3
   (b) Implement the following Boolean expression using NAND gates: 3
   $F = A(B + CD) + B\bar{C}$
   (c) What is decoder? Design a 3 to 8 line decoder with truth table and circuit diagram. 4

6. (a) What is Multiplexer? Implement a 4-to-1 line multiplexer. 4
   (b) Describe Programmable Logic Array (PLA) with block diagram. 3
   (c) Design 32 × 4 ROM. 3

7. (a) What is combinational circuit? Write down the design procedure of combinational circuit. 4
   (b) What is full adder? Implement a full adder with two half adder and an OR gate. 4
   (c) Write short note about the terms: Fan out, Fan in, Propagation delay, Noise margin. 2

8. (a) What is the difference combinational circuit and sequential circuit? 2
   (b) Explain the operation of flip flop in brief. 2
   (c) Define SR flip-flop with logic diagram and truth table. 3
   (d) What is Counter? Draw the state diagram of a 3-bit binary counter. 3