

Sylhet Engineering College, Sylhet
(Shahjalal University of Science & Technology)
Department of Computer Science & Engineering

Final Examination, 2024

Course No: CSE 237

Time: 02 (Two) hours

2nd Year 1st Semester

Course Title: Engineering Ethics & Cyber Law

Full Marks: 60

N.B. : (i) Use separate answer scripts for each PART

(ii) Marks allotted are indicated in the margin

(iv) Special Instruction (if any)-----N/A-----

PART-A
(Answer 2 questions)

1. (a) What are the prominent e-Journals published by Bangladeshi universities and research institutions? What are the main objectives of Cyber Law? 04
- (b) What key hardware advancement defined fourth generation computers, and when did emerge? What are the positive and negative societal impacts of computers and the Internet in today's digital age? 05
- (c) Write a short note on: Cyber law from i) global perspective and ii) Bangladesh perspective. 06
2. (a) A college student hacks into a university database and modifies his grades. Identify the cyber offence committed and mentions the corresponding section under the ICT Act, 2006. 05
- (b) What is cyber ethics? Imagine a future where AI can read and manipulate human emotions online. What ethical boundaries should be established? 05
- (c) What is intellectual property (IP), and why IP protection is needed? Why is intellectual honesty important in digital content creation? 05

OR

- (a) What types of cases does the Cyber Tribunal handle? Name some common cybercrimes. 03
- (b) How does the Contract Act, 1872, address modern digital contracts and e-commerce transactions? 03
- (c) What are the different categories of punishments prescribed for cybercrimes in Bangladesh under the ICT Act, 2006? 04
- (d) How do business ethics influence decision-making in a competitive environment, and what guidelines can organizations follow to ensure responsible and ethical conduct? 05

PART-B
(Answer 2 questions)

3. (a) Case: A Bangladeshi developer is sued for copyright violation by a US company for using their code in an e-commerce app. Identify applicable Bangladeshi and international cyber laws. 06
- (b) What are the key benefits of using online contracts in today's digital landscape, and how do they enhance the efficiency and security of agreements between parties? 05
- (c) Define E-Voting. Why are clickwrap contracts beneficial for digital products and services? 04
4. (a) On the grand staircase of Maslow's hierarchy, is there a special step where the soul awakens to moral truths and ethical values? Explain Maslow's Hierarchy of Needs. 05
- (b) How do cross-cultural moral disagreements test the notion of universal morality—do they suggest that morality is a matter of perspective rather than fact? Write Differences and Similarities. 05
- (c) Define conflicts of interest. How does relativism challenge the concept of objective truth in science and philosophy? 05

OR

- (a) Imagine you're a detective solving a mystery. How does sharpening your critical thinking skills help you uncover the truth behind complex ethical dilemmas? 03
- (b) What is the epistemic problem for cognitivism, and how does it challenge the theory's assumptions about knowledge? 03
- (c) How would you handle an ethical dilemma where your personal values conflict with societal norms? 04
- (d) Evaluate how cybersecurity threats and cybercrime have impacted e-commerce growth in Bangladesh. 05

Sylhet Engineering College, Sylhet
(Shahjalal University of Science & Technology)
Department of Computer Science and Engineering

Final Examination, 2024

Course No: CSE 235

Time: 02 (Two) hours

1st
2nd Year ~~3rd~~ Semester

Course Title: Numerical Methods

Full Marks: 60

N.B. : (i) Answer all the questions from each PART
 (iii) Marks allotted are indicated in the margin

(ii) Use separate answer scripts for each PART
 (iv) Special Instruction (if any)-----N/A-----

Part A
[Answer Two Questions]

1. (a) What is interpolation? 02
- (b) Apply Lagrange's interpolation formula to find a polynomial which passes through the points (0, -20), (1, -12), (3, -20) and (4, -24). 07
- (c) Use Euler's method to compute $y(0.9)$ from the following differential equation: 06

$$\frac{dy}{dx} = x^2, y(0) = 1 \text{ and } h = 0.3$$
2. (a) Find inversion matrix of the equation: 05

$$\begin{aligned} x + y + z &= 6 \\ x - y + z &= 2 \\ 2x - y + 3z &= 9 \end{aligned}$$
- (b) Write down the properties of Polynomial equation. 04
- (c) Demonstrate **Gaus-Siedel** method up to 3 iterations for the following system of linear equations with initial guess [1,1,1]: 06

$$\begin{aligned} 5x_1 + x_2 + 2x_3 &= 19 \\ 2x_1 + 4x_2 - 2x_3 &= -2 \\ 2x_1 + 3x_2 + 8x_3 &= 39 \end{aligned}$$

OR

- (a) What is numerical analysis and the goals of it?. 04
- (b) Use **LU decomposition method** to solve the system of equation: 07

$$\begin{aligned} 2x+3y+z &= 9 \\ x+2y+3z &= 6 \\ 3x+y+2z &= 8 \end{aligned}$$
- (c) Differentiate between direct methods and iterative methods for solving systems of equations. 04

Part B
[Answer Two Questions]

3. (a) Let one system have an error of 865250 and by calculating, we found the value is 865200. Find out- Relative, Absolute and Percentage error. 02
- (b) Estimate the value of $\sin\theta$ at $\theta = 25^\circ$ using the Newton-Gregory forward difference formula with the help of the following table: 07

θ	10	20	30	40	50
$\sin\theta$	0.1736	0.3420	0.5000	0.6428	0.7660

- (c) Fit an equation of the form $y = ab^x$ to the following data: 06

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.6

4. (a) Derive the equations/formula of the following terms Modified Euler method, Stirling Formula. 04
- (b) Using **Picard's process** of successive approximations obtain a solution up to the fourth approximation of the equation $\frac{dy}{dx} = 2y + x$, such that $y = 1$ when $x = 0$. Check your answer by finding the exact particular solution 07
- (c) In which conditions forward and Backward differences applied? 04

OR

- (a) Using Milne's predictor method finds y when $x = 0.8$ given 04
 $\frac{dy}{dx} = x - y^2$, $y(0) = 0$, $y(0.2) = 0.02$, $y(0.4) = 0.795$, $y(0.6) = 0.1762$, $y(0.8) = ?$
- (b) Find U_9 if $U_0 = 14$, $U_4 = 22$, $U_8 = 30$, $U_{12} = 38$, $U_{16} = 46$ using the **Gauss formula of Interpolation** 07
- (c) State the condition for the convergence of the iteration method. 04

Sylhet Engineering College, Sylhet
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Department of Computer Science & Engineering

Final Examination, 2024
Course No: EEE 207
Time: 03 (Three) hours

2nd Year 1st Semester
Course Title: Electronic Devices and Circuits
Full Marks: 60

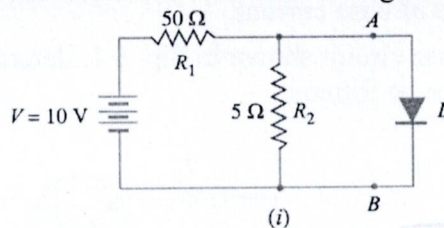
- N.B. : (i) Answer three questions from each PART (ii) Use separate answer scripts for each PART
 (iii) Marks allotted are indicated in the margin (iv) Special Instruction (if any)-----N/A-----

PART-A
(Answer Three Questions)

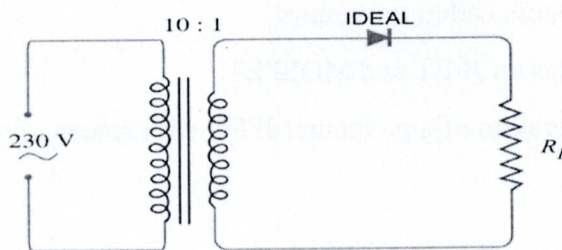
1. (a) Give the energy band description of conductors, semiconductors and insulators. 2
- (b) An a.c. voltage of peak value 20V is connected in series with a silicon diode and load resistance of 700Ω . If the forward resistance of diode is 10Ω , find:
 (i) Peak current through diode; (ii) Peak output voltage
 What will be these values if the diode is assumed to be ideal? 5
- (c) Explain the forward bias and reverse bias conditions of a semiconductor diode with suitable diagrams. 3

OR

- (a) Define reverse current or leakage current. 2
- (b) Differentiate between a rectifier and an inverter based on their function, input/output supply, types, and applications. 3
- (c) Find the current through the diode in the circuit shown in Figure. Assume the diode to be ideal. 5



2. (a) What is pulsating DC? Explain its characteristics with a suitable diagram. 2
- (b) With a neat sketch, explain the working of Centre-tap full wave rectifier 3
- (c) An a.c. supply of 230 V is applied to a half-wave rectifier circuit through a transformer of turn ratio 10: 1. Find (i) the output d.c. voltage and (ii) the peak inverse voltage. Assume the diode to be ideal. 5



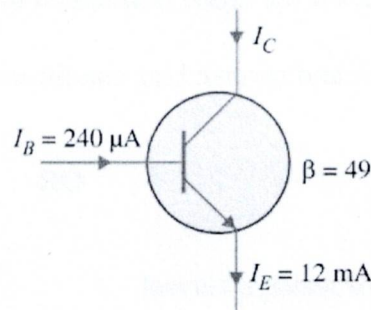
3. (a) In a common base connection, current amplification factor is 0.9. If the emitter current is 1mA, determine the value of base current. 5
- (b) An n-p-n transistor at room temperature has its emitter disconnected. A voltage of 5V is applied between collector and base. With collector positive, a current of $0.2\mu\text{A}$ flows. When the base is disconnected and the same voltage is applied between collector and emitter, the current is found to be $20\mu\text{A}$. Find α , I_E and I_B when collector current is 1mA. 5

PART-B
(Answer Three Questions)

4. (a) Explain the difference between diode and transistor. 2
 (b) What are the applications of filter? Explain CE configuration of BJT. 3
 (c) A crystal diode having internal resistance $r_f = 39 \Omega$ is used for half-wave rectification. If the applied voltage $v = 45 \sin \omega t$ and load resistance $R_L = 850 \Omega$ then find: 5
 i) I_m, I_{rms}, I_{dc} ii) Input and output power iii) dc output voltage iv) efficiency

OR

- (a) Explain transistor action. 2
 (b) Explain the differences between Common Base (CB), Common Emitter (CE), and Common Collector (CC) transistor configurations in terms of input/output impedance, current gain, voltage gain, and typical applications. 3
 (c) Find the α rating of the transistor shown in figure. Hence, determine the value of I_c using both α and β rating of the transistor. 5



5. (a) In a common base connection, current amplification factor is 0.9. If the emitter current is 1mA, determine the value of base current. 5
 (b) For the common base circuit shown in Fig. 5.1, determine: I_C and V_{CB} . 5
 Assume transistor to be Silicon.

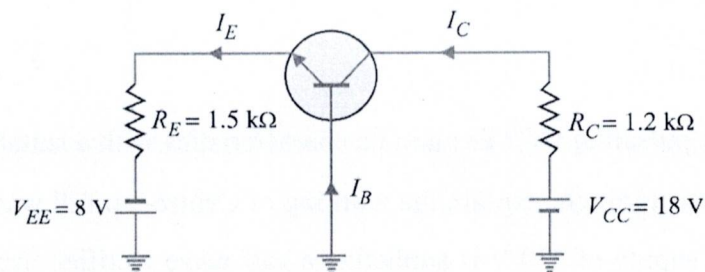


Fig. 5.1

6. (a) Why are transistors called transistors? 2
 (b) Write short notes on JFET and MOSFET. 3
 (c) Explain the operation of a p-channel JFET with schematic diagram. 5

Sylhet Engineering College, Sylhet
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Department of Computer Science & Engineering

Final Examination, 2024
Course No: CSE 233
Time: 03 (Three) hours

2nd Year 1st Semester
Course Title: Object Oriented Programming Language
Full Marks: 60

N.B. : (i) Answer all questions from each PART
 (iii) Marks allotted are indicated in the margin

(ii) Use separate answer scripts for each PART
 (iv) Special Instruction (if any)-----N/A-----

PART-A

1. (a) At what point is the `Bar` object created on Line A eligible for garbage collection? Justify your answer. 2

```
class Bar { }
class Test {
    Bar getBarObject() {
        Bar b = new Bar(); // Line A
        return b; // Line B }
}
```

```
public static void main(String args[]) {
    Test t = new Test(); // Line C
    Bar firstBar = t.getBarObject(); // Line D
    firstBar = null; // Line E
    System.out.println("Main thread running"); //Line F } }
```

- (b) What is Narrowing Conversion? What is the difference with Java and C/ C++? Explain the following line of program segment. 1+2
+2

```
import java.lang.Math.sqrt(x);
```

- (c) What will be the output of the following program segment?

```
class Demo {
    static int x = initialize();
    static {
        System.out.println("Inside static block
of Demo");}
    static int initialize() {
        System.out.println("Initializing x");
        return 100; }
}
```

```
public static void display() {
    System.out.println("Static method display() called");
}
public static void main(String[] args) {
    System.out.println("Value of x: " + x);
    display();
    System.out.println("End of main"); } }
```

3

2. (a) Write the output of the following code segment: 3

```
class Vehicle {
    public void move() {
        System.out.println("Vehicle is moving."); } }
class Car extends Vehicle {
    public void move() {
        super.move();
        System.out.println("Car drives on roads."); } }
class Boat extends Vehicle {
    public void move() {
        super.move();
        System.out.println("Boat sails on water."); } }
```

```
public class TransportTest {
    public static void main(String[] args) {
        Car car = new Car();
        Boat boat = new Boat();
        car.move();
        boat.move(); } }
```

- (b) i) Write the output of the following code segment: 3+2

```
public class StringMethodsDemo {
    public static void main(String[] args) {
        String text = " Java Programming Language ";
        String trimmed = text.trim();
        System.out.println("After trim: " + trimmed + "");
        String part = trimmed.substring(5, 16);
        System.out.println("Substring (5-15): " + part);
    }
}
```

```
int index = trimmed.indexOf('g', 10);
System.out.println("Index of 'g' from
position 10: " + index);
StringBuilder sb1 =
new StringBuilder("Object");
StringBuilder sb2 =
new StringBuilder(" Oriented");
sb1.append(sb2);
System.out.println("After append: " +
sb1); } }
```

ii) Explain following methods:

a) `s2=s1.trim()` b) `s1.append(s2)` c) `p.indexOf('t',n)`

- (c) What will be output of the following program? 2

```
class Counter{
    static int count=0;
    Counter(){
        count++;
        System.out.println(count); }
}
```

```
public static void main(String args[]){
    Counter c1=new Counter();
    Counter c2=new Counter();
    Counter c3=new Counter();
} }
```

3. (a) Write general form of an interface definition. Differentiate between class and interface. Is the below program written correctly? If yes, what will be the output? 1+2
+2.
5
- | | |
|---|--|
| <pre>interface Calculator { int calculate(int x);} class SC implements Calculator { public int calculate(int x) { return x * x; }}}</pre> | <pre>public class InterfaceTest { public static void main(String[] args) { Calculator c = new SC(); System.out.println("Result: " + c.calculate(5));}}</pre> |
|---|--|

- (b) Why we use **this** keyword? Discuss different level of access protection available in java. 1+2
- (c) What will be the output of the following program? 1.5
- | | |
|---|---|
| <pre>class Test{ static int multi(int a, int b){ return a*b=b*b;} static double add(double a, double b){ return a+b;} }</pre> | <pre>class Test{ public static void main(String[] args){ System.out.println(Test.multi(11,11)); System.out.println(Test.add(12.3,12.6)); }}</pre> |
|---|---|

OR

- (a) What is method overriding? Write three restrictions of static methods. 2
- (b) Will the following program work properly? Does the program represent polymorphism property of java and how? 4
- ```
public class Main {
 public static void main(String[] args) {
 main();
 }
 static void main(){
 System.out.println("Its main method");
 } }
```
- (c) What happens if java allows multiple inheritance? 2
- (d) Write down the use of "**final**" keyword for variable, methods and class declaration. 2

**PART-B**

4. (a) Write the Hierarchy of Collection Framework. Explain following methods of collection interfaces: 2+3  
containsAll(Collection c),subList(int startindex,int endindex),subMap(Object start,Object end),setElementat(object e,int index)
- (b) Define file, record, field and byte. What will be the output of the following program segment? 2+3
- |                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre>import java.util.*; public class CityFilter {     public static void main(String[] args) {         Vector&lt;String&gt; cities = new         Vector&lt;&gt;();         cities.add("Sylhet");         cities.add("Chittagong");         cities.add("Dhaka");         cities.add("Barishal");         cities.add("Khulna");         System.out.print("Cities starting with 'D': ");</pre> | <pre>Iterator&lt;String&gt; it = cities.iterator(); while (it.hasNext()) {     String city = it.next();     if (city.startsWith("D")) {         System.out.print(city + " ");     } } }</pre> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
5. (a) What will be the output of the following program? 3
- |                                                                                                                                                                                                        |                                                                                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre>class Demo implements Runnable{     public void run(){         for(int i=10;i&gt;0;i--){             System.out.println("\nThread: "+i); }         System.out.println("End of Thread"); } }</pre> | <pre>class Test{     public static void main(String args[]){         Demo obj=new Demo();         Thread tobj =new Thread(obj);         tobj.start();         System.out.println("End of main Thread"); }</pre> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
- (b) Define synchronization? Consider the following Java program segment. X and Y as int variables. What will be the output if Y initialized to 5? What will be the output if Y initialized to 0? 2+3

```
X=5;
try {
 p=X/Y;
 System.out.println("Inside try");}
catch(NumberFormatException e){
 System.out.println("Inside catch");}
```

```
catch(Exception e){
 System.out.println("Inside exception");}
finally {
 System.out.println("Inside finally");}
System.out.println("Inside main");}
```

- (c) Write the states of life cycle of an applet and draw state transition diagram

2

OR

- (a) How applets differ from application. Suppose left side of program segment (A.java) is in p1 package and Right side of program segment (B.java) is in mypack package. What will be the output

```
package p1;
public class A {
 public void msg(){
 System.out.println("Hello");}
}
```

```
package mypack;
import p1.A;
class B {
 public static void main(String args[]){
 A obj = new A();
 obj.msg(); } }
```

- (b) Is the following program segment is correct? If not make a correction of it.

```
public class GraphicsDemo extends Applet {
 public void paint(Graphics g){
 g.setColor(color.red);
 g.drawString("Welcome",50, 50);
 g.drawLine(20,300);
 g.drawRect(70,100,30,30);}
```

```
g.fillRect(170,100,30,30);
g.drawOval(70,200,30,30);
g.setColor(color.pink);
g.fillOval(170,200,30,30);
g.drawArc(90,150,30,30,30,270);
g.fillArc(270,150,30,30,0,180); } }
```

- (c) Write name of state of an applet life cycle and draw an applet's transition diagram.

2

6. (a) Suppose you have text file named "buffer.txt" contains text "CSESEC 16<sup>th</sup> batch". What will be the output of the following program segment?

```
import java.io.File;
import java.io.IOException;
public class CreateFile {
 public static void main(String[] args) {
 try {
 File myObj = new File("buffer.txt");
 if (myObj.createNewFile())
 {System.out.println("File created: " +
 myObj.getName());}
```

```
else {
 System.out.println("File already exists.");
}} catch (IOException e) {
 System.out.println("An error occurred.");
 e.printStackTrace();
} } }
```

- (b) Is the following program segment is correct? If not make a correction of it.

```
1. class button {
2. button(){
3. Frame f = new Frame();
4. Button b1 = new Button("OK");
5. b1.setBounds(100, 50, 50, 50);
6. f.add();
7. Button b2 = new Button("SUBMIT");
8. b2.setBounds(100, 101, 50, 50);
9. f.add(b2);
```

```
10. Button b3 = new
 Button("CANCEL");
11. b3.setBounds(100, 150, 80, 50);
12. f.add(b3);
13. f.setSize(500, 500);
14. f.setLayout(null);
15. f.setVisible(true);
16. }
17. public static void main(String
 a[]) { new button(); } }
```

- (c) What is Exception? Write down the use of "try-catch-finally" block and show an example of "Array index out of bound exception" by writing a Java Program.

1+3

**Sylhet Engineering College, Sylhet**  
**(Shahjalal University of Science & Technology)**  
**Department of Computer Science & Engineering**

**Final Examination, 2024**  
**Course No: IPE 201**  
**Time: 02 (Two) hours**

**2<sup>nd</sup> Year 1<sup>st</sup> Semester**  
**Course Title: Management for Engineers**  
**Full Marks: 60**

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N.B.: (i) Answer any all questions from each PART (ii) Use separate answer scripts for each PART  
(iii) Marks allotted are indicated in the margin (iv) Special Instruction (if any)-----N/A-----

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**PART-A**  
**(Answer 2 Questions)**

1. (a) Explain the advantages and limitations of budgetary control 07
- (b) Describe the steps involved in preparing a cash budget. Why is it important for businesses? 04
- (c) Differentiate between a fixed budget and a flexible budget. Provide examples of situations where each would be useful. 04
2. (a) A company produces 1000 personal computers daily. Explain the implications of Material Requirement Planning (MRP) and Just in Time (JIT) ? 05
- (b) How is labor cost related to productivity? List and explain the costs involved with the labor. 05
- (c) Explain the components of Material Requirement Planning (MRP). How does it give benefit to a company? 05

**OR**

- (a) Differentiate between "cost," "expense," and "loss" with examples. 04
- (b) Define "cost" and explain its three fundamental components as outlined in the document. 03
- (c) What are mixed (semi-variable) costs? Illustrate with an example and explain how they are analyzed. 03
- (d) A company has the following cost structure at 10,000 units of production: 05
  - Fixed Costs: Tk. 50,000
  - Variable Costs per Unit: Tk. 12
  - Semi-Variable Costs: Tk. 20,000 (40% fixed, 60% variable)

From the given data, answer the following questions:

- i. Calculate total cost at 10,000 units.
- ii. Compute total cost at 15,000 units.
- iii. Determine the variable cost per unit and total fixed cost at 15,000 units.

**PART-B**  
**(Answer 2 Questions)**

3. (a) What are the sunk costs? Why are they considered irrelevant in decision-making? Provide an example. 04
- (b) A product sells for Tk. 100 per unit. Variable costs are Tk. 60 per unit, and fixed costs are Tk. 1,00,000 annually. 05
  - i. Compute the break-even point (units and Tk.).
  - ii. Calculate the profit if 4,000 units are sold.

- (c) ABC Manufacturing reports the following for 2023:
- Direct Material: Tk. 1,20,000
  - Factory Rent: Tk. 60,000
  - Sales Commission: Tk. 25,000
  - Office Salaries: Tk. 40,000
  - Depreciation (Factory Machinery): Tk. 30,000

From the given data:

- i. Classify each cost as product cost or period cost.
  - ii. Calculate total product costs and total period costs.
4. (a) Define Expenditure, Cost, Expense, Loss and compare them. 03
- (b) A company can sell unfinished goods for Tk. 50,000 or process further for an additional cost of Tk. 20,000 to sell for Tk. 80,000. 06
- i. Calculate the opportunity cost of processing further.
  - ii. Should the company process further? Justify.
- (c) A company sells a product for Tk. 80 per unit. Variable costs are Tk. 50 per unit, and fixed costs total Tk. 1,20,000 annually. 06
- i. Calculate the contribution margin per unit and contribution margin ratio.
  - ii. Determine the break-even point in units and sales taka.
  - iii. Compute the margin of safety (in taka) if actual sales are Tk. 4,00,000.

OR

- (a) What is meant by utilities in manufacturing overhead? 02
- (b) What does mean by Contract Costing? Write down the features of Contract Costing 05
- (c) The BBA Construction Company undertakes large contracts. The following particulars relate to contract No. 125 carried out during the year ended on 31st March 2015. 08

| Particulars                                   | Rs.      |
|-----------------------------------------------|----------|
| Work certified by architect                   | 1,43,000 |
| Cost of work not certified                    | 3,400    |
| Plant installed at site                       | 11,300   |
| Value of plant on 31st March 2015             | 8,200    |
| Materials sent to site                        | 64,500   |
| Labour                                        | 54,800   |
| Establishment charge                          | 3,200    |
| Wages accrued on 31st March                   | 1,800    |
| 2015 Direct expenditure                       | 2,400    |
| Materials on hand on 31st March               | 1,400    |
| 2015 Materials returned to store              | 400      |
| Direct expenditure accrued on 31st March 2015 | 200      |
| Contract price                                | 2,00,000 |
| Cash received from contractee                 | 1,30,000 |

**Sylhet Engineering College, Sylhet**  
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**Department of Computer Science & Engineering**

**Final Examination, 2023**  
**Course No: STA 201**  
**Time: 03 (Three) hours**

**2<sup>nd</sup> Year 1<sup>st</sup> Semester**  
**Course Title: Statistics for Engineers**  
**Full Marks: 60**

- N.B. : (i) Answer any all questions from each PART (ii) Use separate answer scripts for each PART  
 (iii) Marks allotted are indicated in the margin (iv) Special Instruction (if any)-----N/A-----

**PART-A**  
**(Answer 3 Questions)**

1. (a) What do you mean by statistics? Discuss the application and limitation of statistics. 3
- (b) What is data? Discuss different types data with example. 3
- (c) Explain how Statistics plays an important role in Machine Learning? 4
2. Imagine we're conducting a survey on the time spent by students studying on weekdays at a university called Blue Ridge University. The university's administration wants to understand the study habits of students to improve academic support services. We surveyed 50 randomly selected students from various departments in Blue Ridge University. The study times (in minutes) recorded are: 45, 50, 60, 55, 70, 85, 75, 90, 40, 95, 80, 100, 110, 120, 115, 65, 55, 70, 75, 50, 60, 85, 90, 95, 100, 105, 70, 80, 85, 95, 110, 115, 50, 45, 60, 65, 70, 85, 90, 95, 100, 105, 110, 120, 125, 130, 135, 140, 145, 150
- (a) Construct a frequency distribution choosing appropriate class interval. 4
- (b) Using the above data, draw a histogram and a frequency polygon on the same graph. 4
- (c) Determine whether the data is skewed or not from the histogram drawn above. 2
3. (a) Define measures of dispersion. Discuss the various measures of dispersion? 5
- (b) Virat Kohli's runs in the last 10 innings of ODI matches are given below: 5  
 50, 55, 49, 52, 60, 56, 58, 53, 61, 62  
 Also, Babar Azam's scores in the last 10 innings of ODI matches are given below:  
 47, 51, 53, 62, 61, 63, 60, 65, 66, 64  
 Who would be considered more consistent in terms of their batting performances? Based on the information above, choose a suitable measure of dispersion to answer this question.

**OR**

3. The following table shows the distribution of test scores for 60 students:
 

|             |       |       |       |       |       |
|-------------|-------|-------|-------|-------|-------|
| Score Range | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 |
| Frequency   | 8     | 12    | 20    | 15    | 5     |
- (a) Calculate the range, inter-quartile range (IQR), variance, and standard deviation of the rainfall data. 6
- (b) Analyze the skewness of the test scores using the quartiles and interpret the results. 4

**PART-B**  
**(Answer 3 Questions)**

4. The following data relate to the volume of investment and corresponding amount of profit per year.

|                         |   |    |    |    |    |
|-------------------------|---|----|----|----|----|
| Investment (in lac Tk.) | 5 | 10 | 15 | 20 | 25 |
| Profit (in lac Tk.)     | 3 | 4  | 8  | 12 | 18 |

- (a) Compute the coefficient of correlation between investment and profit. Also interpret the results. 4
- (b) Estimate the linear regression line of profit and investment. 4
- (c) Compute the expected amount of profit if the volume of investment in Taka 32 lac. 2

OR

4. In a training scheme for young people, the average time taken for each group to reach a certain level of proficiency was measured. The data are shown below in the table:

|                          |    |    |    |    |    |    |    |    |    |    |
|--------------------------|----|----|----|----|----|----|----|----|----|----|
| Age $x$ (years)          | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| Average time $y$ (hours) | 12 | 11 | 10 | 9  | 11 | 8  | 9  | 7  | 6  | 8  |

- (a) Calculate the Pearson's Correlation Coefficient ( $r$ ). 5
- (b) Describe and interpret the relationship between average time and age. 3
- (c) Give a reason whether or not the answer in part (b) supports a linear relationship between  $x$  and  $y$ . 2
5. Suppose the distribution function of a random variable  $X$  is given by

$$F(X) = \begin{cases} 0; & \text{for } x < 0 \\ \frac{x}{3}; & \text{for } 0 \leq x \leq 1 \\ \frac{1}{3}; & \text{for } 1 \leq x \leq 2 \\ \frac{x-1}{3}; & \text{for } 2 \leq x < 4 \\ 1; & \text{for } x \geq 4 \end{cases}$$

- (a) Is this distribution function continuous or discrete? Explain why? 2
- (b) What is the probability that  $X$  is greater than 3? 4
- (c) What is the probability that  $X$  is greater than 3 given that  $X$  is greater than 2? 4
6. (a) The average number of traffic accidents per week on a certain section of highway is two per week. Assume that the number of accidents follows Poisson distribution.
- i) Find the probability of no accidents on this section of highway during a 1-week period. 2
- ii) Find the probability of at most three accidents on this section of highway during a 2-week period. 2
- (b) To monitor long-term traffic conditions, a traffic control authority defines two states for this highway section based on weekly accident count: State 0: Low accident week (0 or 1 accident) State 1: High accident week (2 or more accidents). Historical data shows the following transition probabilities: If a week is a Low accident week (State 0), the probability that the next week is also a Low accident week is 0.6. If a week is a high accident week (State 1), the probability that the next week is a high accident week is 0.7.
- i) Construct the transition probability matrix for this two-state Markov chain. 3
- ii) If the current week is a Low accident week, what is the probability that the next two weeks are both High accident weeks? 3

**STANDARD NORMAL DISTRIBUTION:**  
**Table Values Represent AREA to the LEFT of the Z score.**

| Z   | .00    | .01    | .02    | .03    | .04    | .05    | .06    | .07    | .08    | .09    |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0.0 | .50000 | .50399 | .50798 | .51197 | .51595 | .51994 | .52392 | .52790 | .53188 | .53586 |
| 0.1 | .53983 | .54380 | .54776 | .55172 | .55567 | .55962 | .56356 | .56749 | .57142 | .57535 |
| 0.2 | .57926 | .58317 | .58706 | .59095 | .59483 | .59871 | .60257 | .60642 | .61026 | .61409 |
| 0.3 | .61791 | .62172 | .62552 | .62930 | .63307 | .63683 | .64058 | .64431 | .64803 | .65173 |
| 0.4 | .65542 | .65910 | .66276 | .66640 | .67003 | .67364 | .67724 | .68082 | .68439 | .68793 |
| 0.5 | .69146 | .69497 | .69847 | .70194 | .70540 | .70884 | .71226 | .71566 | .71904 | .72240 |
| 0.6 | .72575 | .72907 | .73237 | .73565 | .73891 | .74215 | .74537 | .74857 | .75175 | .75490 |
| 0.7 | .75804 | .76115 | .76424 | .76730 | .77035 | .77337 | .77637 | .77935 | .78230 | .78524 |
| 0.8 | .78814 | .79103 | .79389 | .79673 | .79955 | .80234 | .80511 | .80785 | .81057 | .81327 |
| 0.9 | .81594 | .81859 | .82121 | .82381 | .82639 | .82894 | .83147 | .83398 | .83646 | .83891 |
| 1.0 | .84134 | .84375 | .84614 | .84849 | .85083 | .85314 | .85543 | .85769 | .85993 | .86214 |
| 1.1 | .86433 | .86650 | .86864 | .87076 | .87286 | .87493 | .87698 | .87900 | .88100 | .88298 |
| 1.2 | .88493 | .88686 | .88877 | .89065 | .89251 | .89435 | .89617 | .89796 | .89973 | .90147 |
| 1.3 | .90320 | .90490 | .90658 | .90824 | .90988 | .91149 | .91309 | .91466 | .91621 | .91774 |
| 1.4 | .91924 | .92073 | .92220 | .92364 | .92507 | .92647 | .92785 | .92922 | .93056 | .93189 |
| 1.5 | .93319 | .93448 | .93574 | .93699 | .93822 | .93943 | .94062 | .94179 | .94295 | .94408 |
| 1.6 | .94520 | .94630 | .94738 | .94845 | .94950 | .95053 | .95154 | .95254 | .95352 | .95449 |
| 1.7 | .95543 | .95637 | .95728 | .95818 | .95907 | .95994 | .96080 | .96164 | .96246 | .96327 |
| 1.8 | .96407 | .96485 | .96562 | .96638 | .96712 | .96784 | .96856 | .96926 | .96995 | .97062 |
| 1.9 | .97128 | .97193 | .97257 | .97320 | .97381 | .97441 | .97500 | .97558 | .97615 | .97670 |
| 2.0 | .97725 | .97778 | .97831 | .97882 | .97932 | .97982 | .98030 | .98077 | .98124 | .98169 |
| 2.1 | .98214 | .98257 | .98300 | .98341 | .98382 | .98422 | .98461 | .98500 | .98537 | .98574 |
| 2.2 | .98610 | .98645 | .98679 | .98713 | .98745 | .98778 | .98809 | .98840 | .98870 | .98899 |
| 2.3 | .98928 | .98956 | .98983 | .99010 | .99036 | .99061 | .99086 | .99111 | .99134 | .99158 |
| 2.4 | .99180 | .99202 | .99224 | .99245 | .99266 | .99286 | .99305 | .99324 | .99343 | .99361 |
| 2.5 | .99379 | .99396 | .99413 | .99430 | .99446 | .99461 | .99477 | .99492 | .99506 | .99520 |
| 2.6 | .99534 | .99547 | .99560 | .99573 | .99585 | .99598 | .99609 | .99621 | .99632 | .99643 |
| 2.7 | .99653 | .99664 | .99674 | .99683 | .99693 | .99702 | .99711 | .99720 | .99728 | .99736 |
| 2.8 | .99744 | .99752 | .99760 | .99767 | .99774 | .99781 | .99788 | .99795 | .99801 | .99807 |
| 2.9 | .99813 | .99819 | .99825 | .99831 | .99836 | .99841 | .99846 | .99851 | .99856 | .99861 |
| 3.0 | .99865 | .99869 | .99874 | .99878 | .99882 | .99886 | .99889 | .99893 | .99896 | .99900 |
| 3.1 | .99903 | .99906 | .99910 | .99913 | .99916 | .99918 | .99921 | .99924 | .99926 | .99929 |
| 3.2 | .99931 | .99934 | .99936 | .99938 | .99940 | .99942 | .99944 | .99946 | .99948 | .99950 |
| 3.3 | .99952 | .99953 | .99955 | .99957 | .99958 | .99960 | .99961 | .99962 | .99964 | .99965 |
| 3.4 | .99966 | .99968 | .99969 | .99970 | .99971 | .99972 | .99973 | .99974 | .99975 | .99976 |
| 3.5 | .99977 | .99978 | .99978 | .99979 | .99980 | .99981 | .99981 | .99982 | .99983 | .99983 |
| 3.6 | .99984 | .99985 | .99985 | .99986 | .99986 | .99987 | .99987 | .99988 | .99988 | .99989 |
| 3.7 | .99989 | .99990 | .99990 | .99990 | .99991 | .99991 | .99992 | .99992 | .99992 | .99992 |
| 3.8 | .99993 | .99993 | .99993 | .99994 | .99994 | .99994 | .99994 | .99995 | .99995 | .99995 |
| 3.9 | .99995 | .99995 | .99996 | .99996 | .99996 | .99996 | .99996 | .99996 | .99997 | .99997 |