S.Y.B.Sc.(I.T.) – Semester IV (March 2024)
CORE JAVA
(Time: 2½ hours) **Total Marks: 75**

N. B.: (1) **All** questions are **compulsory**.
(2) Make **suitable assumptions** wherever necessary and **state the assumptions** made.
(3) Answers to the **same question** must be **written together**.
(4) Numbers to the **right** indicate **marks**.
(5) Draw **neat labeled diagrams** wherever **necessary**.
(6) Use of **Non-programmable** calculators is **allowed**.

1. Attempt *any three* of the following: **15**

a. Explain constructor and its type.
b. Explain JDK, JRE and JVM.
c. Define Class, Method and Object? Show the syntax to define these in java
d. Explain different types of classes in java
e. Explain difference between java and C++.
f. Explain any five features of java.

2. Attempt *any three* of the following: **15**

a. Explain super keyword with example.
b. Write a short note on access specifiers in Java.
c. Write a Java program to create an interface Area with one method AreaCompute() with 2 float parameters. Design 2 classes Rectangle and Circle implementing the Area Interface.
d. Explain how multiple inheritance is achieved in java with example
e. Explain the concept of function overriding with example.
f. Explain difference between interface and class

3. Attempt *any three* of the following: **15**

a. Explain life cycle of thread with a neat labeled diagram.
b. Write a java program to create own exception for Negative Value Exception if the user enters negative value.
c. Write a java program to find the factorial value of the given number using user defined package concept
d. What is exception handling? Explain keywords used for exception handling.
e. Explain any five thread control methods.
f. How do you create your own package and import it in a Java program? Explain the procedure step-wise using a suitable example.

4. Attempt *any three* of the following: **15**

a. What is swing? Explain its features.
b. Explain the following layout managers.
(i) Border layout. (ii) Grid layout.
c. Write about: TextField, CheckBox and Label controls.
d. Write a simple Java Swing program to create a JButton by inherit the JFrame Class?
e. Explain adapter class with example.
f. Explain Source, Event and Listeners in event handling.

5. Attempt *any three* of the following: **15**

a. Consider a table student(rollno,name,gender) write a program to accept the values at runtime and insert them in the database using prepare statement.
b. Explain JListbox with example
c. Explain JTabbedPane with example.
d. Write a program to demonstrate JScrollPane.
e. What are Scrollable Resultset in JDBC?
f. What is JDBC ? Explain the architecture of JDBC in detail.

S.Y.B.Sc.(I.T.) – Semester IV (March 2024)
INTRODUCTION TO EMBEDDED SYSTEMS

(Time: 2½ hours)

Total Marks: 75

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1. Attempt *any three* of the following: **15**

a. Explain Embedded system concept with washing machine.
b. Discuss Rom allocation in PIC.
c. Explain major component of Architecture of PIC.
d. List all advantages and disadvantages of ARM controller.
e. Explain in details ARM programming model.
f. List all application of Embedded System.

2. Attempt *any three* of the following: **15**

a. Explain DAC concept with suitable theory?
b. Write a short note on following concept
1. Half Duplex Method 2. Full Duplex Method
c. Discuss Infrared technique.
d. Write a short note on Wi-Fi.
e. Discuss Zigbee protocol concept.
f. "GSM is playing major role in device communication." Justify this statement with suitable theory.

3. Attempt *any three* of the following: **15**

a. Explain any 2 Analog I/O functions with program.
b. What is meaning of Arduino IDE?
c. Discuss any 2 digital I/O functions with program.
d. Discuss any 2 Timer functions with program.
e. Explain conditional statement concept with suitable example.
f. Discuss ATmega328 Microcontroller.

4. Attempt *any three* of the following: **15**

a. Write a program of gas sensor.
b. Discuss PIR with example program.
c. How ultrasonic sensor works? Explain with program.
d. Discuss working of servo motor with program.
e. Write a short note on Analog sound sensor.
f. How LDR sensor works? Explain with program.

5. Attempt *any three* of the following: **15**

a. Explain air quality monitor using Arduino.
b. Write a short note on Smart Thermostat.
c. Discuss Smart home energy monitor.
d. Write a case study on firefighting robot.
e. Describe case study on intelligent lock system using Arduino.
f. Discuss concept of smart garden irrigation system.

S.Y.B.Sc.(I.T.) – Semester IV (March 2024)
COMPUTER ORIENTED STATISTICAL TECHNIQUES

(Time: 2½ hours) **Total Marks: 75**

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1. Attempt *any three* of the following: **15**

a. Find the Arithmetic mean of following values. 4350, 7200, 6750, 5480, 7940, 3820, 5920, 8450, 4900, 5350

b. From the following data, find the value of median.

Income (Rs)	450	500	630	550	710	580
No. of persons	29	31	21	25	11	35

c. Find Quartile Deviation and Coefficient of Quartile deviation from the following data:

Marks	10	20	30	40	50	60
No. of students	7	10	18	12	10	6

d. Calculate standard deviation: 340, 360, 390, 345, 355, 388, 372, 363, 277, 351.

e. Calculate the mean deviation:

x	20	21	22	23	24
f	6	15	21	15	6

f. From the following data, find the value of mode.

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of students	3	5	7	10	12	15	12	6	2	8

2. Attempt *any three* of the following: **15**

a. Find the raw moments for the following data: 5, 8, 2, 4, 6.

b. For the following ungrouped data find the Karl Pearson's Coefficient of Skewness. 12,18,25,15, 16, 10, 8 15, 27,14

c. For the following distribution find β_2 and comment on the kurtosis of the distribution:

x	2	3	4	5
f	4	3	2	1

d. A pair of fair dice is rolled. What is the probability that the sum of upper most face is 6, given that both of the numbers are odd?

e. Given that $P(A) = \frac{3}{7}, P(B) = \frac{2}{7}$, if A and B are independent events than find
i) $P(A \cap B)$ *ii)* $P(\bar{B})$ *iii)* $P(A \cup B)$ *iv)* $P(\bar{A} \cap \bar{B})$.

f. A random variable X has probability mass function as follows find k and expected value of x.

X	-1	0	1	2	3
P(X)	k	0.2	0.3	2k	2k

3. Attempt *any three* of the following: **15**

a. Define the terms: Population, Sample, Parameter, Statistic, Sampling Distribution

b. Define Type-I and Type-II error

S.Y.B.Sc.(I.T.) – Semester IV (March 2024)
COMPUTER ORIENTED STATISTICAL TECHNIQUES

c. The average monthly electricity consumption for a sample of 100 families is 1250 units. Assuming the standard deviation of electric consumption of all families is 150 units, construct a 95% confidence interval estimate of the actual mean electric consumption.
d. A random sample of size 16 has the sample mean 53. The sum of the squares of deviation taken from the mean value is 150. Obtain 99% confidence limits of the sample mean.
e. The following data has been collected for a sample from a normal population: 5, 10, 8, 11, 12, 6, 15, 13. What is the point estimate of population mean and standard deviation?
f. Explain the term level of significance, p-value and power of a test.

4. **Attempt *any three* of the following:** 15

a. A machinist is making engine parts with axle diameter of 0.7 inch. A random sample of 10 parts show a mean diameter of 0.742 inch with a standard deviation of 0.04 inch. Compute the statistic you would use to test whether the work is meeting the specifications and state the conclusion.
b. In one sample of 8 observations, the sum of the squares of deviations of the sample values from the sample mean was 84.4 and in the other sample of 10 observations it was 102.6. Test whether this difference is significant at 5% LOS given that 5% point of F for v1 =7 and v2 = 9 degree of freedom is 3.29.
c. Tests of breaking strengths were carried out on two lots of 5 and 9 steel wires respectively. The variance of one lot was 230 and that of other was 492. Is there a significant difference in their variability? $[F_{0.05}(8,4) = 6.04]$
d. Explain Chi-Square test for goodness of fit.
e. If x is chi-square variate with standard deviation 4. Find the mean and mode of x.
f. 200 randomly selected adults were asked whether TV shows as a whole are primarily entertaining, educational or a waste of time (only one answer could be chosen). The respondents were categorized as follows:(Test whether the data is independent)

Gender	Opinion			Total
	Entertaining	Educational	Waste of time	
Female	52	28	30	110
Male	28	12	50	90
Total	80	40	80	200

5. **Attempt *any three* of the following:** 15

a. Fit a straight line of the form y = a + b x, using least square method

x	0	1	2	3	4
y	1	2.9	4.8	6.7	8.6

b. Fit a parabola of the form $y = a + bx + cx^2$ using least square method:

x	0	1	2
y	1	6	17

c. Calculate the coefficient of correlation for the following data:

x	-2	-1	0	1	2
y	4	1	0	1	4

d. The ranks according to judges in a beauty contest are

R_1	1	2	3	4	5	6
R_2	4	1	2	3	6	5

e. If $\sum x = 37, \sum y = 71, \sum xy = 563, \sum x^2 = 297, \sum y^2 = 1079, n = 5$. Find any one regression equation.
f. The two regression lines are given by $x + 2y = 5, 2x + 3y = 8$. Find the values of $\bar{x}, \bar{y}, r$.

S.Y.B.Sc.(I.T.) – Semester IV (March 2024)
SOFTWARE ENGINEERING

(Time: 2½ hours)

Total Marks: 75

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(4) Numbers to the **right** indicate **marks**.
(5) Draw **neat labeled diagrams** wherever **necessary**.
(6) Use of **Non-programmable** calculators is **allowed**.

1. Attempt *any three* of the following: **15**

a. Explain Spiral Model with a neat diagram.
b. Write a note on Rational Unified Process phases.
c. Describe the characteristics of a great SRS.
d. Define sprint. Explain the working of scrum in detail.
e. Differentiate between generic software and customized software.
f. Explain Software Development Life Cycle (SDLC) with the help of a diagram.

2. Attempt *any three* of the following: **15**

a. What is a socio-technical system? Explain.
b. Write a note on Legacy System.
c. Define system dependability. Explain the four dimensions of dependability.
d. What is a critical system? State and explain the types of critical systems.
e. What is feasibility study? Explain technical and economical feasibility.
f. Discuss DFD and its notations. Give example for context level diagram.

3. Attempt *any three* of the following: **15**

a. What is software project management? Discuss how software engineering is different from other types of engineering?
b. What is Architectural Design? Discuss three advantages of explicitly designing and documenting a software architecture.
c. List and explain user interface design principles.
d. What is Risk Identification? Explain the six types of risk that can arise.
e. Write a note on quality planning.
f. Explain the User Interface design process with a neat diagram.

4. Attempt *any three* of the following: **15**

a. What is software Inspection? Explain the roles of Inspection.
b. Write a note on Integration Testing.
c. Explain the different cost estimation techniques.
d. Write a note on Static analysis.
e. Discuss the purpose of software testing. Describe manual and automation testing in detail.
f. Explain software measurement and its types.

5. Attempt *any three* of the following: **15**

a. Write a note on Service Oriented Software Engineering.
b. Define process measurement. Explain about types of process metrics.
c. Discuss Architectural Pattern for Distributed Systems.
d. What are the issues of distributed system? Discuss.
e. Differentiate between COTS Integrated systems and COTS Solution systems.
f. Define software product line. Explain the various types of specialization of software product lines.

S.Y.B.Sc.(I.T.) – Semester IV (March 2024)
COMPUTER GRAPHICS AND ANIMATION

(Time: 2½ hours) **Total Marks: 75**

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(3) Answers to the **same question** must be **written together**.
(4) Numbers to the **right** indicate **marks**.
(5) Draw **neat labeled diagrams** wherever **necessary**.
(6) Use of **Non-programmable** calculators is **allowed**.

1. Attempt *any three* of the following: **15**

a. Explain types of Computer Graphics softwares.
b. Write a short note on Storage Tube Graphics displays.
c. Distinguish between raster scan display device and random scan display device.
d. Use Bresenham's line drawing algorithm to rasterize line from (6,5) to (15,10).
e. What are the various problems of aliasing list them? Explain any one with help of example.
f. Explain Sutherland Hodgeman algorithm for polygon clipping.

2. Attempt *any three* of the following: **15**

a. Explain translation 2D-transformation with the help of example.
b. Write a short on Viewing transformation.
c. Perform a 45° Rotation of an object with co-ordinates (2,1), (5,1) and (5,6) in the clockwise direction and give the coordinates of the transformed object.
d. Explain Orthographic and Oblique Projection.
e. Shear a unit cube situated at origin with a shear transformation matrix:

$$T_{shear} = \begin{bmatrix} 1 & -0.85 & 0.25 & 0 \\ -0.75 & 1 & 0.7 & 0 \\ 0.5 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

f. Write a short note on affine transformation.

3. Attempt *any three* of the following: **15**

a. Short note on Canonical View Volume (CVV).
b. Explain with labelled diagram stages in 3D viewing.
c. What is light? Explain Radiometry in brief.
d. Explain different properties of Bidirectional Reflectance Distribution Function (BRDF).
e. Explain HSI color space in detail.
f. Write a short note on chromatic adaptation.

4. Attempt *any three* of the following: **15**

a. What is z-buffer algorithm used for? List the advantages and disadvantages.
b. What is meant by BSP trees? Explain algorithm for construction of it with example.
c. Distinguish between Object Space method and Image Space method.
d. Explain parametric representation of Circle.
e. Construct Bezier curve of order 3, with 4 polygon vertices A(1,1), B(2,3), C(4,3),D(6,4) for values of u, $0 \leq u \leq 1$ where p(u) is a point on curve with values for u =(0,1/4).
f. Write a note on B-Spline curves.

5. Attempt *any three* of the following: **15**

a. Define Computer Animation. State and explain any two applications of Animation.

b. State five principles of Computer Animation.

c. Explain Physics-based animation.

d. Equalize the following histogram for L=8.

Gray Level	0	1	2	3	4	5	6	7
No. of Pixel	790	1023	850	656	329	245	122	81

e. Explain the concept of median filtering with suitable example.

f. What is image compression? Explain lossless compression technique.