SG – 627

**II Semester B.C.A. Examination, September/October 2021**
**(CBCS) (2014 – 15 and Onwards) (F+R)**
**COMPUTER SCIENCE**
**BCA 205 : Numerical and Statistical Methods**

Time : 3 Hours Max. Marks : 100

***Instruction :*** *Answer **all** Sections.*

## SECTION – A

I. Answer **any ten** of the following. **(10×2=20)**

1) Find the sum of $0.245 \times 10^3$ and $0.456 \times 10^2$ and write the result in three digit mantissa form.

2) Define relative and absolute error.

3) Write the formula for Secant method.

4) Construct the forward difference table for the following data :

| X | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Y | 8 | 11 | 9 | 15 | 6 |

5) Write the Lagrange Interpolation formula.

6) Explain Gauss-Seidal method for solving the system of linear equations.

7) Write Simpson's $\left(\frac{3}{8}\right)^{th}$ rule formula.

8) Find the positive root of the equation $x^3 - 3x - 5 = 0$ between the interval [2, 2.5] by Bisection method (solve upto one approximation).

9) Find the median of the following :

| X : | 15 10 5 19 17 2 25 |
|---|---|

10) A target is hit by 2 men $M_1$ and $M_2$ independently. The probability that $M_1$ hits the target is $\frac{3}{4}$ and that of $M_2$ is $\frac{1}{2}$. What is the probability that both can hit the target.

11) If $E(X) = 5$ and $E(X^2) = 74$, Find the SD of X.

12) Write the formula to calculate Karl Pearson's coefficient of correlation.

P.T.O.

## SECTION – B

II. Answer **any six** of the following. **(6×5=30)**

13) Determine the single-precision machine representation of the decimal number 52.234375.

14) Find a real root of the equation $x^3 - 7x + 5 = 0$ by Bisection method upto 6 stages.

15) Find a polynomial of degree two, which takes the values.

| X | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| Y | 1 | 2 | 4 | 7 | 11 | 16 | 22 | 29 |

Also find f(9).

16) Using Lagrange's formula find f(10) from the following data :

| X | 5 | 6 | 9 | 11 |
|---|---|---|---|---|
| f(x) | 12 | 13 | 14 | 16 |

17) Calculate $\int_0^1 \frac{dx}{(1+x)}$ using Trapezoidal rule by dividing into 6 equal parts.

18) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ using Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule.



19) Solve the system of equations by Gauss-Jacobi iterative method :
$10x + y + z = 12$ ; $2x + 10y + z = 13$ ; $2x + 2y + 10z = 14$.

20) Solve the system of equations by Doolittle's method
$5x - 2y + z = 4$ ; $7x + y - 5z = 8$ ; $3x + 7y + 4z = 10$.

## SECTION – C

III. Answer **any six** of the following : **(6×5=30)**

21) Use Gauss-elimination method to solve the system of equations :
$x + y + z = 9$ ; $2x + y - z = 0$ ; $2x + 5y + 7z = 52$.

22) Solve the system of equations by Gauss-Seidal method :
$5x + 2y + z = 12$ ; $x + 4y + 5z = 15$ ; $x + 2y + 5z = 20$. Calculate upto 3 iterations by taking initial approximation as (1, 0, 3).

23) Find the largest Eigen value and the corresponding Eigen vector of the matrix by using power method $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$.

24) Using Picard's method, solve $\frac{dy}{dx} = -xy$ with $x_0 = 0$, $y_0 = 1$ upto third approximation.

25) Find by Taylor's series method the value of y at x = 0.1 and x = 0.2 to five places of decimals from $\frac{dy}{dx} = x^2y - 1,\ y(0) = 1$.

26) Solve by Runge-Kutta method for y = 1 when x = 0 for x = 0.2 given $\frac{dy}{dx} = x + y^2$.

27) Calculate the mean by step-deviation method

| **Class** | 1 – 10 | 11 – 20 | 21 – 30 | 31 – 40 | 41 – 50 | 51 – 60 |
|---|---|---|---|---|---|---|
| **Frequency** | 3 | 16 | 26 | 31 | 16 | 8 |

28) Compute the Standard Deviation (SD) for the following data :

| **C.I** | 0 – 10 | 10 – 20 | 20 – 30 | 30 – 40 | 40 – 50 | 50 – 60 | 60 – 70 |
|---|---|---|---|---|---|---|---|
| **f** | 1 | 4 | 17 | 45 | 26 | 5 | 2 |

## SECTION – D

IV. Answer **any four** of the following. **(4×5=20)**

29) Find Karl Pearson's Co-efficient of skewness for the following data :

| **Year (x)** | 10 | 20 | 30 | 40 | 50 | 60 |
|---|---|---|---|---|---|---|
| **No. of Kids (f)** | 15 | 32 | 51 | 28 | 17 | 109 |

30) Find the rank correlation coefficient for a group of students between their internal and external marks.

| **Internal** | 110 | 100 | 140 | 120 | 80 | 90 |
|---|---|---|---|---|---|---|
| **External** | 70 | 60 | 80 | 90 | 10 | 20 |

31) State and prove Baye's theorem.

32) If A and B are independent events, show that $\bar{A}$ and $\bar{B}$ are also independent.

33) If A and B are events with $P(A) = \frac{1}{2}$, $P(A \cup B) = \frac{3}{4}$ and $P(\bar{B}) = \frac{5}{8}$ find the following :

a) $P(A \cap B)$ b) $P(\bar{A} \cap \bar{B})$ c) $P(\bar{A} \cap B)$

34) The probability density function of a variate X is

| **X** | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| **P(X)** | K | 3K | 5K | 7K | 9K | 11K | 13K |

Find K, $P(X < 4)$, $P(X \geq 5)$.