Q.P. Code : [16 SC 01/
16 CA 01/16 IT 01/
16 CTG 01/16 SS 01/
16 MM 01/19 HSN 03]

(For the candidates admitted from 2016 onwards)

B.Sc./B.C.A. DEGREE EXAMINATION, NOVEMBER 2019.

First Semester

Part III — Computer Science/Computer Application/Information Technology/ Computer Technology/Software Systems/Multimedia and Web Technology/Hardware System and Net Working

Allied : MATHEMATICAL STRUCTURE FOR COMPUTER SCIENCE

Time : Three hours   Maximum : 75 marks

SECTION A — (10 × 1 = 10 marks)

Answer ALL questions.

Multiple choice questions.

Choose the correct answer

1. The rank of the matrix $\begin{pmatrix} 1 & -1 & 2 \\ 2 & -2 & 4 \\ 4 & -4 & 8 \end{pmatrix}$ is

   (a) 1

   (b) 2

   (c) 3

   (d) 4

2. Inverse of $\begin{pmatrix} 3 & 1 \\ 5 & 2 \end{pmatrix}$ is

   (a) $\begin{pmatrix} 2 & -1 \\ -5 & 3 \end{pmatrix}$

   (b) $\begin{pmatrix} -2 & -5 \\ -1 & -3 \end{pmatrix}$

   (c) $\begin{pmatrix} 3 & -1 \\ -5 & -3 \end{pmatrix}$

   (d) $\begin{pmatrix} -3 & 5 \\ 1 & -2 \end{pmatrix}$

3. In gauss elimination method the coefficient matrix is transformed into

   (a) upper triangular matrix

   (b) lower triangular matrix

   (c) null matrix

   (d) none of these

4. Gauss-Seidal method is

   (a) Direct method

   (b) Iteration method

   (c) Relaxation method

   (d) None of these

5. If a set of numerical values of the integral $f(x)$ a single valued function is applied to $\int\limits_{a}^{b} f(x)dx$ then that process is known as

(a) a numerical integration

(b) quadrature

(c) interpolation

(d) none of these

6. To improve the accuracy of the result $\int\limits_{a}^{b} f(x)dx$ by using trapezoidal rule

(a) by increasing the number of intervals and decreasing the value of h

(b) by decreasing the number of intervals and decreasing the value of h

(c) by decreasing the number of intervals and increasing the value of h

(d) by increasing the number of intervals and increasing the value of h

7. Which of the following are true for all sets of data

(a) Arithmetic mean $\leq$ median $\leq$ mode

(b) Arithmetic mean $\geq$ median $\geq$ mode

(c) Arithmetic mean $=$ median $=$ mode

(d) None of these

8. 10 is the mean of a set of 7 observations and 5 is the mean of a set of 3 observations. The mean of a combined set is given by

(a) 15

(b) 10

(c) 8.5

(d) 7.5

9. The correlation coefficient always lies between

(a) $-\infty$ to $+\infty$

(b) -1 to $+1$

(c) -3 to $+3$

(d) None of these

10. The coefficient of correlation is independent of

(a) change of scale only

(b) change of origin only

(c) both change of scale and origin

(d) neither change of scale nor change of origin

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Find the inverse of the matrices.

$$\begin{pmatrix} 3 & 1 & -1 \\ 2 & -2 & 0 \\ 1 & 2 & -1 \end{pmatrix}.$$

Or

(b) Find the eigen values of $A = \begin{pmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{pmatrix}$.

12. (a) Apply Gauss elimination method to solve the equations.

$3x + 4y + 5z = 40; \; 2x - 3y + 4z = 13, \; x + y + z = 9$

Or

(b) Apply Gauss-Jordan method to solve the equation.

$x + 4y - z = -5, \; x + y - 6z = -12, \; 3x - y - z = 4$

13. (a) Find the first and second derivatives of the function tabulated at the point $x = 1.1$ and $x = 1.2$.

x:	1.0	1.2	1.4	1.6	1.8	2.0
y:	0	0.128	0.544	1.296	2.432	4.00

Or

(b) Evaluate $\int_{0}^{10} \dfrac{dx}{1 + x^2}$ by using Trapezoidal rule.

14. (a) Calculate the mean for the following frequency distribution.

Class-Interval :	0-8	8-16	16-24	24-32	32-40	40-48
Frequency :	8	7	16	24	15	7

Or

(b) What is standard deviation? Explain its superiority over other measures of dispersion.

15. (a) The marks obtained by 10 students in statistics and computer programming are given below. Find the correlation coefficient.

Marks in Statistics (x) : 75 30 60 80 53

Marks in computer programming (y) : 45 54 91 58 63

Marks in Statistics (x) : 15 40 38 48 35

Marks in computer programming (y) : 35 43 45 44 85

Or

(b) Equations of two regression lines are $8x - 10y + 66 = 0$, $40x - 18y = 214$ then find the correlation coefficient of between x and y.

SECTION C — (5 × 8 = 40 marks)

Answer ALL questions.

16. (a) Find the value of 'k' for which the matrix is of rank 3.

$$\begin{pmatrix} 6 & 3 & 5 & 9 \\ 5 & 2 & 3 & 6 \\ 3 & 1 & 2 & k \end{pmatrix}.$$

Or

(b) If $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \\ 3 & 3 & 1 \end{pmatrix}$ find the eigen values of $A^3 + 10A^2 - 2A$.

17. (a) Solve the following equations by Gauss-Jordan method $x + 3y + 2z = 17$, $x + 2y + 3z = 16$, $2x - y + 4z = 13$.

Or

(b) Solve the following using Gauss-Seidal method.

$54x + y + z = 110$, $2x + 15y + 6z = 72$,

$$-x + 6y + 27z = 85.$$

18. (a) Obtain the value of $f'(90)$ using Stirling's formula to the following data.

x :	60	75	90	105	120
$f(x)$:	28.2	38.2	43.2	40.9	37.7

Or

(b) Evaluate $\int_{0}^{\frac{\pi}{2}} \sin x\, dx$ by

    (i)   Trapezoidal rule

    (ii) Simpson's rule using 11 ordinates.

19. (a) Given below is the distribution of 140 candidates obtaining marks X in a certain examination.

X :   10   20   30   40   50   60   70   80   90   100

C.f : 140 133 118 100 75 45 25 9 2 0

Calculate the mean, median and mode of the distribution.

Or

(b) For a group of 200 candidates, the mean and standard deviation of scores were found to be 40 and 15 respectively. Later on it was discovered that the scores 43 and 35 were misread as 34 and 53 respectively. Find the corrected mean and standard deviation corresponding to the corrected figures.

20. (a) In a partially destroyed laboratory record of an analysis of correlation data, the following results only are legible.

Variance of X = 9

Regression equation : $8x - 10y + 66 = 0$, $40x - 18y = 214$

What were :

    (i)   the mean values of X and Y

    (ii) the correlation coefficient between X and Y

    (iii) the standard deviation of Y?

Or