

Reg. No. : .....

5681

Q.P. Code : [21 SC 03]

(For the candidates admitted from 2021 onwards)

B.Sc./B.C.A. DEGREE EXAMINATION,  
JANUARY 2022.

First Semester

Part III — Computer Science / Computer Application /  
Information Technology / Computer Technology /  
Software Systems / Multimedia and Web Technology /  
Hardware Systems and Networking Computer Science  
and Application

Allied : MATHEMATICAL STRUCTURES FOR  
COMPUTER SCIENCE

Time : Three hours

Maximum : 50 marks

Answer ALL questions.

PART A — ( $10 \times 1 = 10$  marks)

Choose the correct answer :

1. For any square matrix if  $\text{rank} < n$  then
  - (a)  $|A| = 1$
  - (b)  $A$  is singular
  - (c)  $|A| = n$
  - (d)  $A$  is non singular

2. If  $B = 2A$  and  $A = \begin{pmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{pmatrix}$  what are the eigen

values of B?

- (a)  $3/2, 1, 5/2$  (b)  $-3, -2, -5$   
(c)  $4, 6, 10$  (d)  $2, 3, 5$

3. The iterative method of solving simultaneous equation is \_\_\_\_\_ method.

- (a) Gauss Elimination  
(b) Gauss Jordan  
(c) Gauss seidal  
(d) Newton Raphson

4. In Gauss Elimination method of solving simultaneous linear equation the coefficient matrix A is reduced into \_\_\_\_\_.

- (a) Diagonal matrix  
(b) Lower triangular matrix  
(c) Unit matrix  
(d) Upper triangular matrix

5.  $\Delta y_1 =$  \_\_\_\_\_.

- (a)  $y_0 - y_1$  (b)  $y_1 - y_0$   
(c)  $y_2 - y_1$  (d)  $y_1 - y_2$

6. Using Newtons forward interpolation formula to find  $x$  at which the function is maxima or minima from the given tabular values we assume ———.
- (a)  $\frac{dy}{dx} > 0$  (b)  $\frac{dy}{dx} < 0$   
(c)  $\frac{dy}{dx} = 0$  (d)  $\frac{dy}{dx} = 1$
7. The sum of squares of deviation of set of values is ——— When taken about mean.
- (a) mode (b) Crude mode  
(c) median (d) mean
8. The relation between Arithmetic mean (A.M.), Geometric mean (G.M.) and Harmonic mean (H.M.) is
- (a)  $A.M > G.M > H.M$  (b)  $A.M > H.M > G.M$   
(c)  $G.M > H.M > A.M$  (d)  $G.M > A.M > H.M$
9. The variables  $x$  and  $y$  are not linearly correlated when ———.
- (a)  $r = 0$  (b)  $r = 1$   
(c)  $r = -1$  (d)  $r = \pm 1$
10. Regression coefficients are independent of
- (a) Change of origin  
(b) Change of scale  
(c) Change of origin and scale  
(d) Change of origin but not scale



PART B — ( $5 \times 3 = 15$  marks)

Answer ALL questions.

11. (a) Find the inverse of the matrix

$$A = \begin{pmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{pmatrix}.$$

Or

- (b) Find the Rank of the matrix

$$A = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 6 & 7 & 8 & 9 & 10 \\ 11 & 12 & 13 & 14 & 15 \\ 16 & 17 & 18 & 19 & 20 \\ 21 & 22 & 23 & 24 & 25 \end{pmatrix}$$

12. (a) Solve by Gauss elimination method

$$\begin{aligned} x - y + z &= 1, & -3x + 2y - 3z &= -6, \\ 2x - 5y + 4z &= 5. \end{aligned}$$

Or

- (b) Solve the following system of equation by Gauss Jordan method

$$5x + 3y = 11, \quad 2x + 9y = 20$$

- (b) If  $x$  and  $y$  same mean and regression lines are  $y = ax + b$ ,  $x = ay + \beta$  find common mean and correlation coefficient.

PART C — ( $5 \times 5 = 25$  marks)

Answer ALL questions.

16. (a) Verify Cayley-Hamilton theorem for the

$$\text{matrix } A = \begin{pmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{pmatrix}.$$

Or

- (b) Find the eigen values and eigen vectors of

$$\text{the matrix } A = \begin{pmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{pmatrix}.$$

17. (a) Solve by Gauss Jordan method

$$x + 2y + z = 3, 2x + 3y + 3z = 10,$$

$$3x - y + 2z = 13$$

Or

- (b) Solve the following system of equation by Gauss — Seidel method.

$$8x - 3y + 2z = 20; 4x + 11y - z = 33;$$

$$6x + 3y + 12z = 35.$$

18. (a) Evaluate  $\int_0^1 e^{-x^2} dx$  using Trapezoidal rule by taking  $n = 5$ .

Or

- (b) Evaluate  $\int_0^{\pi} \sin x dx$  by Simpson's rule dividing the range into 10 equal parts.

19. (a) Obtain Mean, Median and Mode of the following.

$x:$	10-25	25-40	40-55	55-70	70-85	85-100
$f:$	6	20	44	26	3	1

Or

- (b) Following are the marks obtained by two students. Who is more intelligent and who is more consistent?

A	74	75	78	72	78	77	79
B	87	84	80	88	89	85	86



20. (a) Obtain the coefficient of correlation and find the lines of regression from the data given below.

x:	22	26	29	30	31	31	34	35
y:	20	20	21	29	27	24	27	31

Or

- (b) If  $\theta$  be the angle between the lines of regression, show that  $\tan \theta = \frac{1-r^2}{r} \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}$ .