

Reg. No. :

6544 **Q.P. Code : [08 SC 03/08 CTG 03/
08 MM 03/11 CA 03/
11 IT 03/11 SS 03]**

(For the candidates admitted from 2008–2015)

B.Sc./B.C.A. DEGREE EXAMINATION, APRIL 2021.

First Semester

Part III — Comp. Sci. / Comp. Tech. / Multimedia and
Web. Tech. / Comp. Appli. / Inf. Tech. / Soft. Sym.

**MATHEMATICAL STRUCTURE OF
COMPUTER SCIENCE**

Time : Three hours

Maximum : 75 marks

SECTION A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. Find the sum of the eigen values of

$$A = \begin{pmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{pmatrix}$$

(a) 0

(b) 4

(c) 5

(d) 6

2. Find the eigen values of the matrix $\begin{pmatrix} 3 & 1 & 4 \\ 0 & 2 & 0 \\ 0 & 0 & 5 \end{pmatrix}$.
- (a) 3, 1, 4 (b) 3, 0, 0
(c) 0, 0, 5 (d) 3, 2, 5
3. Newton-Raphson method is related to _____ of the curve
- (a) normals (b) tangent
(c) x-axis (d) curvature
4. Newton's iterative formula to find the value of $\frac{1}{N}$ is
- (a) $x_{n+1} = x_n(2 + Nx_n)$
(b) $x_{n+1} = x_n\left(2 - \frac{x_n}{N}\right)$
(c) $x_{n+1} = \frac{2 + Nx_n}{x_n}$
(d) $x_{n+1} = x_n(2 - Nx_n)$
5. Trapezoidal rule which is applicable only when n is _____
- (a) Any value of n (b) a multiple of 2
(c) a multiple of 3 (d) a multiple of 5

6. In Taylor series the truncation error is _____
- (a) $\frac{h^n}{n} f^n(\theta)$ (b) $\frac{h^n}{n!} f^n(\theta)$
- (c) $\frac{h^n}{n!} f(\theta)$ (d) $\frac{h^n}{n!} f'(\theta)$
7. The best measure of central tendency is
- (a) mean (b) median
- (c) mode (d) Q_1
8. The empirical formula is _____
- (a) mean – mode = 3 (mean – median)
- (b) mean + mode = 3 (mean + median)
- (c) mean + mode = 3 (mean – median)
- (d) mean – mode = (mean – median) / 3
9. The regression lines are $x = \bar{x}$ and $y = \bar{y}$ then $r =$ _____
- (a) -1 (b) 1
- (c) 0 (d) $\frac{1}{2}$
10. The 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 of scale

SECTION B — (5 × 5 = 25 marks)

Answer either (a) or (b) in each questions.

11. (a) Find the rank of $A = \begin{pmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{pmatrix}$.

Or

(b) Find the inverse of $A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -2 & 2 \end{pmatrix}$.

12. (a) Solve by Gauss elimination method

$$x + y + z = 3$$

$$2x - y + 3z = 16$$

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

Or

(b) Using Gauss-Seidel method solve

$$8x - 3y + 2z = 20$$

$$4x + 11y - z = 33$$

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

13. (a) Find $y(22)$ from the data given below:
- | | | | | | | |
|------|-----|-----|-----|-----|-----|-----|
| $x:$ | 20 | 25 | 30 | 35 | 40 | 45 |
| $y:$ | 354 | 332 | 291 | 260 | 231 | 204 |

Or

- (b) Evaluate $\int_0^6 \frac{1}{1+x} dx$ using Simpson's rule by dividing the range into 6 equal parts.

14. (a) The mean marks got by 275 students in Mathematics is 47. The mean of the top 75 of them was 59 and the mean of the last 100 was 28. What is the mean of the remaining 100 students?

Or

- (b) Calculate the range and the quartile deviation for the following distribution.

Class :	0-10	10-20	20-30	30-40	40-50	50-60	60-70
$f:$	8	12	17	14	9	7	4

15. (a) If the regression lines are $12x - 15y + 99 = 0$ and $64x - 27y = 373$, find the means and correlation coefficient of x and y .

Or

- (b) Explain Binomial distribution. Also state the mean, mode and standard deviation of the distribution.

SECTION C — (5 × 8 = 40 marks)

Answer either (a) or (b) in each questions.

16. (a) Find the eigen values and eigen vectors of

$$A = \begin{pmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{pmatrix}$$

Or

- (b) Verify Cayley-Hamilton theorem for the

matrix $A = \begin{pmatrix} 1 & 0 & -1 \\ 3 & 4 & 5 \\ 0 & -6 & -7 \end{pmatrix}$

17. (a) Find a positive root of $x^3 - 9x + 1 = 0$ by bisection method.

Or

- (b) Find the positive root of $x^3 = 2x + 5$ by False position method.

18. (a) Using Taylor series method find $y(0.1)$, given $\frac{dy}{dx} = x^2 + y^2$ and $y(0) = 1$.

Or

- (b) Apply the fourth order Runge-Kutta method to find $y(0.2)$ given that $\frac{dy}{dx} = x + y$, $y(0) = 1$

19. (a) For the following data calculate mean, median and mode.

Class :	0-10	10-20	20-30	30-40	40-50	50-60
<i>f</i> :	14	17	22	26	23	18

Or

- (b) Consider scores by two batsman, which batsman is more consistent and which batsman is more efficient.

<i>A</i> :	53	25	60	70	50	42	82
<i>B</i> :	17	78	61	55	54	66	44

20. (a) Calculate the coefficient of linear correlation and the lines of regression from the following data.

<i>x</i> :	22	26	29	30	31	31	34	35
<i>y</i> :	20	20	21	29	27	24	27	31

Or

- (b) Fit a Poisson distribution to the following data.

<i>x</i> :	0	1	2	3	4
<i>f</i> :	43	38	22	9	1
