6622

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

(For the candidates admitted from 2016 onwards)

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

First Semester

Part III – Computer Science / Computer Applications /
Information Tech. / Computer Tech. / Software Systems/
Multimedia and Web Tech. / Hardware Systems and
Networking

MATHEMATICAL STRUCTURE FOR COMPUTER
SCIENCE

Time : Three hours   Maximum : 75 marks

SECTION A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. 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, 2, 4   (d)   3, 2, 5

2. If 2, 3, 4 be the eigen values of A, then $|A|$ is

   (a) 9   (b) 24

   (c) $\dfrac{1}{24}$ (d) $\dfrac{1}{9}$

3. If $A = \begin{pmatrix} -1 & 0 & 0 \\ 2 & -3 & 0 \\ 1 & 4 & 2 \end{pmatrix}$, the eigen values of A^2 is

   (a) $-1, -3, 2$ (b) 1, 3, 2

   (c) 1, 9, 4   (d) $\dfrac{1}{-1}, \dfrac{1}{-3}, \dfrac{1}{2}$

4. Gauss – Elimination method is —————— method.

   (a) Indirect method   (b) Iterative method

   (c) Direct method   (d) Approximate method

5. The value of ∇y_2 is

   (a) $y_2 - y_1$ (b) $y_2 - y_3$

   (c) $y_1 - y_2$ (d) $y_3 - y_2$

6. Gauss – Seidel method converges if

   (a) The no.of unknown and no.of equations are same

   (b) The system statistics diagonal dominance property

   (c) The rank of coefficient matrix coincides with the number of equations

   (d) The eigen values are distinct

7. If $\bar{x}_1$, $\bar{x}_2$ are the means of n_1 and n_2 observations respectively, then the mean $\bar{n}$ of then combined group is

   (a) $\bar{x}_1 + \bar{x}_2$

   (b) $\dfrac{\bar{x}_1 + \bar{x}_2}{2}$

   (c) $\dfrac{\bar{x}_1 + \bar{x}_2}{n_1 + n_2}$

   (d) $\dfrac{n_1\bar{x}_1 + n_2\bar{x}_2}{n_1 + n_2}$

8. The most reliable measures of dispersion is

   (a) mean deviation

   (b) quartile deviation

   (c) standard deviation

   (d) range

6622

9. The variables are not linearly correlated when
    _____

    (a) $r = 0$ (b) $r = -1$

    (c) $r = 1$ (d) $r = 0.5$

10. The regression lines are $x = \bar{x}$ and $y = \bar{y}$. If
    _____

    (a) $r = 0$ (b) $r = -1$

    (c) $r = 1$ (d) $r = 0.5$

SECTION B — ($5 \times 5 = 25$ marks)

Answer ALL questions.

11. (a) Find the rank of the matrix $A = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \\ 0 & 2 & 1 \end{pmatrix}$.

Or

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

4   **6622**

12. (a) Solve the system is equation by Gauss – Elimination method.

$x + 2y + z = 3$; $2x + 3y + 3z = 10$;
$3x - y + 2z = 13$

Or

(b) Solve using Gauss – Seidel method

$10x - 5y - 2z = 3$; $4x - 10y + 3z = -3$;
$x + 6y + 10z = -3$

13. (a) Find the value of y at $x = 1.05$

x:	1.1	1.2	1.3	1.4	1.5	1.6
y:	0.841	0.891	0.932	0.946	0.985	1.015

Or

(b) Evaluate $\int_{-3}^{3} x^4 dx$ by using Trapezoidal rule, taking $h = 1$.

14. (a) Calculate the range and Quartile deviation for the following distribution

Class:	20-30	30-40	40-50	50-60	60-70	70-80	80-90
f:	3	61	132	153	140	51	2

Or

(b)   Calculate the mean deviation from the mean for the following :

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)   The regression lines are $3x + 2y = 26$ and $6x + y = 31$. Find

(i)   The mean of x and y

(ii)   The correlation coefficient.

Or

(b)   Prove that $|r| \leq 1$.

SECTION C — (5 × 8 = 40 marks)

Answer ALL questions.

16.   (a)   Find the eigen values and eigen vectors of the matrix $x = \begin{pmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{pmatrix}$.

Or

(b)   Verify Cayley – Hamilton theorem and hence find the inverse of $A = \begin{pmatrix} 8 & -8 & 2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{pmatrix}$.

6   6622

17. (a) By Gaussian elimination method, find the inverse of $A = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 2 & 0 \\ 3 & -1 & -4 \end{pmatrix}$.

Or

(b) Solve by Gauss – Jordon method, the following $x + y + z = 3$; $2x - y + 3z = 16$; $3x + y - z = -3$.

18. (a) Find $y(34)$ using Stirling's formula

x :	20	25	30	35	40
y :	11.4699	12.7834	13.7648	14.4982	15.0463

Or

(b) By dividing the range into ten equal parts, evaluate $\int_0^\pi \sin x \, dx$ by Simpson's rule.

19. (a) Calculate the Mean, Median and Mode eof the following :

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

Or

7 **6622**

(b) The cores of two player given below. Who is the better player and also is the more consistent player?

A :	55	54	52	53	56	58	52	50	51	49
B :	108	107	105	105	106	107	104	103	104	101

20. (a) Find the coefficient of correlation and obtain 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) Prove that :

(i) $r = 1 - \dfrac{1}{2n} \sum f \left(\dfrac{x - \bar{x}}{\sigma_x} - \dfrac{y - \bar{y}}{\sigma_y} \right)^2$

(ii) $r = -1 + \dfrac{1}{2n} \sum f \left(\dfrac{x - \bar{x}}{\sigma_x} + \dfrac{y - \bar{y}}{\sigma_y} \right)^2$

Hence Deduce that $-1 \leq r \leq 1$.

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