D 41959-A (Pages : 4) Name.......................................

Reg. No...................................

FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2018

(CUCBCSS—UG)

Mathematics

MAT 4B 04—THEORY OF EQUATIONS MATRICES AND VECTOR CALCULUS

(Multiple Choice Questions for SDE Candidates)

Time : 15 Minutes	Total No. of Questions : 20	Maximum : 20 Marks

INSTRUCTIONS TO THE CANDIDATE

1. This Question Paper carries Multiple Choice Questions from 1 to 20.
2. The candidate should check that the question paper supplied to him/her contains all the 20 questions in serial order.
3. Each question is provided with choices (A), (B), (C) and (D) having one correct answer. Choose the correct answer and enter it in the main answer-book.
4. The MCQ question paper will be supplied after the completion of the descriptive examination.

MAT 4B 04—THEORY OF EQUATIONS MATRICES AND VECTOR CALCULUS

(Multiple Choice Questions for SDE Candidates)

1. If $A = \left[a_{ij}\right]_{m \times n}$ and $a_{ij} = 4 \forall i, j$ then $\rho(A)$ is :

   (A) 0. (B) 1.

   (C) 2. (D) 3.

2. If a matrix A has a non-zero minor of order r, then :

   (A) $\rho(A) = r$. (B) $\rho(A) \geq r$.

   (C) $\rho(A) < r$. (D) $\rho(A) \leq r$.

3. Which of the following is false :

   (A) $\rho(A + B) \leq \rho(A) + \rho(B)$.

   (B) $\rho(A') = \rho(A)$.

   (C) $\rho(A + B) = \rho(A) + \rho(B) - 4$, if A and B are matrices of rank z.

   (D) $\rho(A - B) \leq \rho(A) \cdot \rho(B)$.

4. If $A = \begin{bmatrix} 5 & 0 & 2 \\ 0 & 1 & 0 \\ -4 & 0 & -4 \end{bmatrix}$ and $M = I_3 - A$, then the rank of M is :

   (A) 0. (B) 1.

   (C) 2. (D) 3.

5. The points $(x_1, y_1), (x_2, y_2), (x_3, y_3)$ are collinear if and only if the rank of the matrix $\begin{bmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{bmatrix}$ is :

   (A) < 3. (B) ≤ 3.

   (C) > 3. (D) ≥ 3.

6. If $A = \begin{bmatrix} 1 & 5 & 2 \\ 3 & 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ 1 & 4 \\ 2 & 1 \end{bmatrix}$, then $\rho(AB)$ is :

   (A) 0. (B) 1.

   (C) 2. (D) 3.

7. The rank of the matrix $A = \begin{bmatrix} 0 & 2 & 3 \\ 0 & 4 & 6 \\ 0 & 6 & 9 \end{bmatrix}$ is :

(A) 1. (B) 2.

(C) 3. (D) 4.

8. The rank of the matrix $\begin{bmatrix} 1 & 3 & 4 & 2 \\ 0 & 2 & 1 & 4 \\ 0 & 0 & 2 & 0 \end{bmatrix}$ is :

(A) 3. (B) 4×3.

(C) 2. (D) 1.

9. Rank of the matrix $A = \begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 9 \\ -1 & -3 & -4 & -3 \end{bmatrix}$ is :

(A) 1. (B) 2.

(C) 3. (D) 4.

10. If A is a non-singular matrix of order n, then the rank of A is :

(A) 0. (B) 2.

(C) $n - 1$. (D) n.

11. The rank of the matrix $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$ is :

(A) 0. (B) 1.

(C) 2. (D) 3.

12. If $A = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$, then $\rho(A)$ is :

(A) 1. (B) 2.

(C) 3. (D) 4.

13. If a matrix A can be reduced to the normal form $\begin{bmatrix} I_3 & 0 \\ 0 & 0 \end{bmatrix}$ by using elementary operations, then $\rho(A)$ is :

(A) 4. (B) 3.

(C) 2. (D) 1.

14. Rank (AA') = ____________.

(A) Rank A. (B) Rank A'.

(C) 1. (D) None.

15. For a system of m linear equations in n unknowns Cramer's rule is applicable, when :

(A) $m = n$.

(B) $m \pm n$.

(C) $m = n$ and the coefficient matrix is non-singular.

(D) $m = n$ and the coefficient matrix is singular.

16. The system $Ax = D$ in n unknowns has a non-trivial solution if :

(A) $\rho(A) > n$. (B) $\rho(A) = n$.

(C) $\rho(A) < n$. (D) None of these.

17. A system of m homogeneous linear equations $Ax = 0$ in n unknown has only trivial solution if :

(A) $m = n$. (B) $m \neq n$.

(C) $\rho(A) = m$. (D) $\rho(A) = n$.

18. The system of equations $4x + 6y = 5$

$6x + 9y = 7$

has :

(A) A unique solution. (B) No solution.

(C) Infinitely many solution. (D) None.

19. If A is a square matrix of order n and λ is a scalar, then the characteristic polynomial of A is obtained by expanding the determinant :

(A) $|\lambda A|$. (B) $\lambda |A|$.

(C) $|\lambda_A - I_n|$. (D) $|A - \lambda I_n|$.

20. The characteristic roots of a Hermitian matrix are :

(A) All real. (B) All imaginary.

(C) Some real and some imaginary. (D) None.