Date:

Registration number:

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BENGALURU-27

BCA(DATA ANALYTICS) - II SEMESTER

SEMESTER EXAMINATION: APRIL 2022

(EXAMINATION CONDUCTED IN JULY – AUGUST 2022)

BCADA 2321 – DISCRETE MATHEMATICS II

Time - 2 Hrs **Max Marks - 60**

This question paper contains THREE printed pages and THREE parts

PART A

Answer ALL questions from the following **10 X 1 = 10**

1. If A and B are two matrices of the order 5 × 5 and n × 3, respectively, and n = 5, then the order of matrix (A X B) is
   a. 5 × 3
   b. 3 × 3
   c. m × n
   d. 3 × n
2. The Matrix $\begin{bmatrix} 4 & 3 & 5 \\ 3 & 5 & 6 \\ 5 & 6 & 3 \end{bmatrix}$ is a
   a. identity matrix
   b. symmetric matrix
   c. skew symmetric matrix
   d. none of the these
3. The rank of the matrix $\begin{bmatrix} 3 & 1 & 0 \\ 0 & 8 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ is
   a. 1
   b. 2
   c. 3
   d. None of the above

4. For the solutions of system of equations of the form A X = B, then there exists the solution of the system of equations if
   a. Rank of A= Rank of [A:B]
   b. Rank of A > Rank of [A:B]
   c. Rank of A<Rank of [A:B]
   d. Rank of A≠ Rank of [A:B]

5. The transpose of matrix of the given equation The Matrix $\begin{bmatrix} 5 & 4 & 9 \\ 2 & 1 & 3 \\ 4 & 2 & 8 \end{bmatrix}$ is
   a. $\begin{bmatrix} 5 & 4 & 9 \\ 2 & 1 & 3 \\ 4 & 2 & 8 \end{bmatrix}$
   b. $\begin{bmatrix} 4 & 2 & 8 \\ 5 & 2 & 3 \\ 2 & 1 & 9 \end{bmatrix}$
   c. $\begin{bmatrix} 5 & 2 & 4 \\ 4 & 1 & 2 \\ 9 & 3 & 8 \end{bmatrix}$
   d. None of the above

6. A vector space $V_3(R)$ is a set that is closed under
   a. finite vector addition and scalar multiplication
   b. scalar addition and scalar multiplication
   c. finite vector addition and finite vector multiplication

7. A set $\{a_1, a_2, \ldots\ldots a_n\}$ of vectors of a Vector Space V[F} is said to be linearly independent if $C_1 a_1+C_2a_2+, \ldots\ldots+C_na_n =0$ implies
   a. $C_1, C_2, C_3 \ldots\ldots\ldots C_n$ not all zero
   b. $C_1, C_2, C_3 \ldots\ldots\ldots C_n$ all zero

8. The solution for $\int (\frac{1}{\cos \theta})^2 \, d\theta$
   a. $\tan\theta + C$
   b. Sec θ +C
   c. Cot θ +C

9. The solution of $\int 6x(x^2+6)dx$. Is
   a. $\frac{3}{2} x^4+18x^2+C$
   b. $\frac{3}{2} x^4 - 18x+C$
   c. $\frac{3}{2} x^4 - 18+C$
   d. None of the above

10. Integrals in maths are used to find many useful quantities such as areas, volumes, displacement, etc.
    a. True
    b. False

PART B

Answer any SIX questions from the following **6 X 5 = 30**

11. Find the value of $(A^2 – 5A +7I)$ if $A= \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$

12. Find the rank of the matrix A where A is $\begin{bmatrix} 1 & 2 & -1 & 4 \\ 2 & 4 & 3 & 5 \\ 3 & 2 & 6 & 7 \end{bmatrix}$

13. Find whether the following system possess a non-trivial solution

x-3y+2z = 0
7x-21y+14z = 0
-3x+9y-6z = 0

14. Test the following system for consistency and solve if it consistent

x+2y-z=3
3x-y+2z=1
2x-2y+3z=2

15. Express the vector (1,-2,5) as the linear combination of the vectors (1,1,1),(1,2,3),(2,-1,1)
16. Find the linear transformation $f:R^2 \rightarrow R^2$ such that $f(1,1) = (0,1)$ and $f(-1,1) = (3,2)$
17. Find the value of $\int (4x^3 + 5x^2 - 3)\, dx$
18. Find the value of $\int x \sin x\, dx$

PART C

Answer any TWO questions from the following **2 X 10 = 20**

19. Find the eigen values and corresponding eigen vectors of the matrix $A = \begin{bmatrix} \mathbf{5} & \mathbf{-1} \\ \mathbf{4} & \mathbf{9} \end{bmatrix}$
20. Show that the vectors (1,1,2,4),(2,-1,-5,2), (1,-1,-4,0) and (2,1,1,6) are linearly dependent in R^4 And extract a linearly independent subset. Also find the dimension and a basis of the subspace spanned by them.
21. Find the value of $\int_{-2}^{4} (x^2 + 5x + 3)\, dx$