Reg. No. : ....

Name : ....

II Semester B.Sc. Degree (CBCSS – Supplementary/Improvement) Examination, April 2020
COMPLEMENTARY COURSE IN MATHEMATICS
2C02 MAT-BCA : Mathematics for BCA – II
(2014-2018 Admissions)

Time : 3 Hours   Max. Marks : 40

SECTION – A

All the first 4 questions are **compulsory**. They carry **1** mark **each**.

1. The area of the sector enclosed by the curve $r = f(\theta)$ and the two radii vectors $\theta = \alpha$ and $\theta = \beta$ is _____

2. Define a linearly independent set of vectors.

3. State Cayley-Hamilton Theorem.

4. Define a walk of a graph.

SECTION – B

Answer **any 7** questions from among the questions **5** to **13**. These questions carry **2** marks **each**.

5. Find the area of a loop of the curve $r^2 = a^2 \cos 2\theta$.

6. Find the perimeter of the cardioid $r = a(1 - \cos\theta)$.

7. Find by double integration the area of the region bounded by $y^2 = x$ and $y = x$.

8. Evaluate the determinant $\begin{vmatrix} 0 & 3 & -1 \\ -3 & 0 & -4 \\ 1 & 4 & 0 \end{vmatrix}$ without actually expanding it.

9. Solve by Gauss Elimination method.
$$-2y - 2z = -8$$
$$3x + 4y - 5z = 13$$

10. Find the eigen values of $\begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$.

11. Show that A and A^T have the same eigen values.

12. Draw all graphs with 4 points.

13. Prove that any self complementary graphs has 4n or 4n + 1 points.

SECTION – C

Answer **any 4** questions from among the questions **14** to **19**. These questions carry **3 marks each**.

14. Find the intrinsic equation of the cycloid $x = a (\theta + \sin\theta)$, $y = a (1 - \cos\theta)$, the fixed point being the origin.

15. Find the area bounded by the curve $xy^2 = 4a^2 (2a - x)$ and its asymptote.

16. Determine the inverse of $A = \begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ 1 & 3 & 4 \end{bmatrix}$ by Gauss-Jordan Elimination.

17. Solve the system of equations.
$$x_1 + 2x_2 - 3x_3 - 4x_4 = 6$$
$$x_1 + 3x_2 + x_3 - 2x_4 = 4$$
$$2x_1 + 5x_2 - 2x_3 - 5x_4 = 10$$

18. Find the eigen values and eigen vectors of $\begin{bmatrix} 1 & 1 & -2 \\ -1 & 2 & 1 \\ 0 & 1 & -1 \end{bmatrix}$.

19. Write the adjacency and incidence matrix of the graph.

SECTION – D

Answer **any 2** questions from among the questions **20** to **23**. These questions carry **5** marks **each**.

20. Evaluate $\displaystyle\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyz \; dzdydx$.

21. Find the rank and a basis for the row space and column space of

$$A = \begin{bmatrix} 0 & 3 & 4 \\ -3 & 0 & -5 \\ -4 & 5 & 0 \end{bmatrix}.$$

22. Compute A^4 and A^{-1} using Cayley Hamilton Theorem for the matrix

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 1 & 1 \\ 2 & 3 & 1 \end{bmatrix}.$$

23. If G_1 is a (p_1, q_1) graph and G_2 is a (p_2, q_2) graph then show that
    i) $G_1 \cup G_2$ is a $(p_1 + p_2, q_1 + q_2)$ graph
    ii) $G_1 + G_2$ is a $(p_1 + p_2, q_1 + q_2 + p_1 p_2)$ graph
    iii) $G_1 \times G_2$ is a $(p_1 p_2, q_1 p_2 + p_1 q_2)$ graph.

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