K16U 1227

Reg. No. : ....

Name : ....

II Semester B.C.A. Degree (CCSS-Reg./Supple./Improv.) Examination, May 2016
COMPLEMENTARY COURSE IN MATHEMATICS
2 C02 MAT-BCA : Mathematics for BCA – II
(2014 Adm. Onwards)

Time : 3 Hours

Max. Marks : 40

SECTION – A

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

1. Give an example of a 3×3 non zero singular matrix.
2. What do you mean by the spectrum of a square matrix A ?
3. Find the characteristic polynomial of the matrix $\begin{bmatrix} -5 & 2 \\ 2 & -2 \end{bmatrix}$.
4. Give the adjacency matrix of the complete graph K_3. **(4×1=4)**

SECTION – B

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

5. Find the area of the cardioide $r = a(1 - \cos\theta)$.
6. Find the length of the arc of the equiangular spiral $r = ae^{\theta \cot\alpha}$ between the points for which the radii vectors are r_1 and r_2.
7. Find the inverse of $\begin{bmatrix} 3 & 8 \\ 2 & 1 \end{bmatrix}$.
8. Find the eigen values of the matrix $\begin{bmatrix} 5 & -2 \\ 9 & -6 \end{bmatrix}$.

P.T.O.

9. Give two non-zero matrices A and B such that AB = 0 but BA $\neq$ 0.

10. Prove that the determinant of an orthogonal matrix has value +1 or –1.

11. Show that every cubic graph has an even number of vertices.

12. Show that the partition P = (6, 6, 5, 4, 3, 3, 1) is not graphic.

13. Show by example that there are graphs G such that both G and $\overline{G}$ are connected.

(7×2=14)

SECTION – C

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

14. Find the area of the region lying above the x-axis and included between the circle $x^2 + y^2 = zax$ and the parabola $y^2 = ax$.

15. Evaluate $\iint_A xy\,dx\,dy$ over the positive quadrant of the circle $x^2 + y^2 = a^2$.

16. Evaluate the following determinant by reducing it to triangular form

$$\begin{vmatrix} 2 & 0 & -4 & 6 \\ 4 & 5 & 1 & 0 \\ 0 & 2 & 6 & -1 \\ -3 & 8 & 9 & 1 \end{vmatrix}.$$

17. Find the eigen vectors of $\begin{bmatrix} 1 & 0 & 0 \\ 2 & 4 & 0 \\ 6 & 4 & 2 \end{bmatrix}$.

18. Using Cayley Hamilton theorem, find the inverse of the matrix $\begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$.

19. Prove that any self complementary graph has 4n or 4n + 1 vertices. **(4×3=12)**

SECTION – D

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

20. Find the intrinsic equation of the parabola $y^2 = 4ax$, origin being taken as the fixed point.

21. Solve by Gauss elimination method

$$3x + 7y - 4z = -46$$

$$5w + 4x + 8y + z = 7$$

$$8w + 4y - 2z = 0$$

$$-w + 6x + 2z = 13$$

22. Diagonalize the matrix

$$\begin{bmatrix} 7.3 & 0.2 & -3.7 \\ -11.5 & 1.0 & 5.5 \\ 17.7 & 1.8 & -9.3 \end{bmatrix}.$$

23. Let G_1 be a (p_1, q_1) graph and G_2 be a (p_2, q_2) graph. Then prove the following :

   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 $(p_1 p_2, q_1 p_2 + q_2 p_1)$ graph

   iv) $G_1 [G_2]$ is a $(p_1 p_2, p_1 q_2, + p_2^2 q_1)$ graph. **(2×5=10)**
