K18U 0506

Reg. No. : ....

Name : ....

II Semester B.C.A. Degree (CBCSS – Reg./Supple./Improv.) Examination, May 2018
COMPLEMENTARY COURSE IN MATHEMATICS
2C02 MAT-BCA : Mathematics for B.C.A. II
(2014 Admn. Onwards)

Time : 3 Hours

Max. Marks : 40

SECTION – A

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

1. Evaluate the determinant $\begin{vmatrix} 0 & a & b \\ -a & 0 & c \\ -b & -c & 0 \end{vmatrix}$.

2. What is the relationship between the number of edges of a simple G and the number of edges of its complement $\overline{G}$?

3. Draw the graph with incidence matrix $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$.

4. Give two nonisomorphic graphs with vertex degrees 2, 2, 2, 1, 1.

SECTION – B

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

5. Find the area of the cardioide $r = a(1 - \cos\theta)$.

6. Find the whole length of the astroid $x^{2/3} + y^{2/3} = a^{2/3}$.

7. Prove or disprove : Every diagonal matrix is a scalar matrix.

8. Determine whether the set of vectors [3, 2, 1], [0, 0, 0], [4, 3, 6] is linearly independent or not.

9. Solve the following system :
$3.0x + 6.2y = 0.2$
$2.1x + 8.5y = 4.3$

10. If $A = \begin{bmatrix} 1 & 3 \\ 2 & 6 \end{bmatrix}$, find A^2 using Cayley-Hamilton theorem.

11. Obtain the characteristics polynomial of $\begin{bmatrix} -1 & -3 \\ 4 & 3 \end{bmatrix}$.

12. Show that there can not be a simple graph with six vertices which have degrees 1, 2, 3, 4, 5, 5.

13. Show that the number of odd vertices in a graph is always even.

SECTION – C

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

14. Evaluate $\int_1^{\log 8} \int_0^{\log y} e^{x+y}\, dx\, dy$.

15. Find the area of the curve $r = a(1 + \cos\theta)$, by double integration.

16. Solve by Cramer's rule :
$x_1 - 2x_2 + x_3 = 3$
$2x_1 + x_2 - x_3 = 5$
$3x_1 - x_2 + 2x_3 = 12$.

17. Find an eigen basis for the matrix $A = \begin{bmatrix} 5 & 3 \\ 3 & 5 \end{bmatrix}$.

18. Find all eigen values of $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$. For each eigen value of A, determine its algebraic multiplicity and geometric multiplicity.

19. Let G be a simple graph with 6 vertices. Show that either G or its complement $\overline{G}$ contains K_3 as a subgraph.

SECTION – D

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

20. Find the intrinsic equation of the curve $x = at^2$, $y = 2at$.

21. Find the inverse of the matrix of Gauss-Jordan elimination $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 2 & 7 & 7 \end{bmatrix}$.

22. Let $A = \begin{bmatrix} 2 & 0 & 0 & 0 \\ 5 & 1 & 0 & 0 \\ 0 & 3 & -1 & 0 \\ -1 & 0 & 0 & -2 \end{bmatrix}$. Use the Cayley-Hamilton theorem to find the inverse of A.

23. Show that the maximum number of lines among all p point graphs with no triangles is $\left[\frac{p^2}{4}\right]$.