K21U 3615

Reg. No. : ....

Name : ....
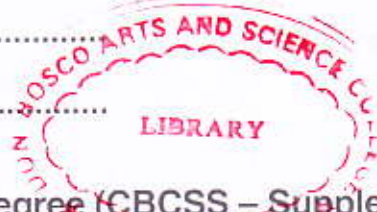
II Semester B.Sc. Degree (CBCSS – Supple.) Examination, April 2021
(2014 – 2018 Admission)
COMPLEMENTARY COURSE IN MATHEMATICS
2C02 MAT – BCA : Mathematics For BCA – II

Time : 3 Hours   Max. Marks : 40

SECTION – A

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

1. Evaluate the double integral $\int\limits_{1}^{2}\int\limits_{0}^{3y} y \, dxdy$.

2. Define a symmetric square matrix. Give an example.

3. If A is an orthogonal matrix then det A = _____

4. Define a complete bipartite graph and give an example.

SECTION – B

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

5. Find the area enclosed between one arc of the cycloid $x = a(\theta - \sin\theta)$, $y = a(1 - \cos\theta)$ and its base.

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

7. Evaluate $\int\limits_{0}^{2}\int\limits_{0}^{x} \dfrac{1}{x^2 + y^2} \, dxdy$.

8. Find the rank of $\begin{bmatrix} 8 & 2 & 5 \\ 16 & 6 & 29 \\ 4 & 0 & -7 \end{bmatrix}$.

P.T.O.

9. Solve by Gauss Elimination method

$y + z = -2$

$4y + 6z = -12$

$x + y + z = 2$.

10. Find the eigenvalues of $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$.

11. Find the characteristic eqn. of $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$.

12. Show that in a digraph D, the sum of indegrees of all the vertices is equal to the sum of their outdegrees, each sum being equal to the no. of arcs in D.

13. Define self complementary graph. Give an example.

SECTION – C

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

14. Show by double integration that the area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ is $\dfrac{16a^2}{3}$.

15. Evaluate $\iiint_V x^2 + y^2 + z^2 \, dxdydz$ where V is the volume of the cube bounded by the coordinate planes and the planes $x = y = z = a$.

16. Find the inverse of $\begin{bmatrix} 1 & 2 & 5 \\ 0 & -1 & 2 \\ 2 & 4 & 11 \end{bmatrix}$.

17. Find the eigenvector corresponding to the eigenvalue $\lambda = 9$ for the matrix $\begin{bmatrix} 3 & 0 & 12 \\ -6 & 3 & 0 \\ 9 & 6 & 3 \end{bmatrix}$.

18. If G_1 is a (p_1, q_1) graph and G_2 is a (p_2, q_2) graph then show that $G_1 \times G_2$ is a $(p_1 p_2, q_1 p_2 + p_2 q_1)$ graph.

19. Define degree sequence of a graph and show that the partition $(7, 6, 5, 4, 3, 2, 1)$ is not graphical.

SECTION – D

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

20. Change the order of integration and hence evaluate the integral

$$\int_0^1 \int_0^{\sqrt{2-y^2}} \frac{x}{\sqrt{x^2 + y^2}} \, dx \, dy.$$

21. Solve the system of equations

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

$x + 2y = 4$

$10y + 3z = -2$

$2x - 3y - z = 5.$

22. Diagonalize the matrix $\begin{pmatrix} 1 & 0 & 1 \\ 0 & 3 & 2 \\ 0 & 0 & 2 \end{pmatrix}$.

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