



K24U 1625

Reg. No.:

Name :

Second Semester B.Sc. Degree (CBCSS – OBE-Regular/Supplementary/
Improvement) Examination, April 2024

(2019 Admission Onwards)

COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS

2C02 MAT-BCA : Mathematics for BCA – II

Time : 3 Hours

Max. Marks : 40

UNIT – I

Short answer type. Answer **any 4** questions.. Each question carries **1** mark. (4×1=4)

1. Find the value of $f(x, y, z) = \sqrt{x^2 - y^3} + 3z$ at the point (4, 0, -4).

2. Find $\lim_{(x,y) \rightarrow (0,0)} \frac{3x^2 - y^2 + 5}{x^2 + y^2 + 2}$.

3. Evaluate $\int \cos^7 x dx$.

4. Define a polar equation.

5. Define Similar Matrices.

UNIT – II

Short essay type. Answer **any 7** questions. Each question carries **2** marks. (7×2=14)

6. Find the domain and range of the function $f(x, y, z) = \sqrt{x^2 + y^4 + z^5}$.

7. If $f(x, y) = x + y$, find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$.

8. Use the chain rule to find the derivative of $w = xy$ with respect to θ along the path $x = \cos \theta$, $y = \sin \theta$. What is the derivative's value at $\theta = \frac{\pi}{2}$?

9. Evaluate $\int_0^{\pi/4} \sin^4 2x dx$.

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10. Find $\int_0^{\pi/2} \cos^2 \theta \, d\theta$.
11. A pyramid 3 m high has a square base that is 3 m on a side. The cross-section of the pyramid perpendicular to the altitude x m down from the vertex is a square x m on a side. Find the volume of the pyramid.
12. Find the area enclosed between $x = 5$, $x = 10$ and $y = x$ and $y = 5 + x$.
13. When can you say that a quadratic form is positive definite ?
14. Find the eigen values of the matrix $\begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{bmatrix}$.
15. Prove that, if B is similar to A , then B has the same eigen values as A .

UNIT - III

Essay type. Answer any 4 questions. Each question carries 3 marks. (4×3=12)

16. Show that $f(x, y) = \begin{cases} \frac{4x^2y}{x^3 + y^3}, & (x, y) \neq (0, 0) \\ 0, & (x, y) = (0, 0) \end{cases}$ is continuous at every point except the origin.
17. Evaluate $\int_0^{\pi} \frac{dx}{(1+x^2)^4}$.
18. Find the value of $\int_0^{\pi/2} \cos^3 x \cos 2x \, dx$.
19. The circle $x^2 + y^2 = a^2$ is rotated about the x -axis to generate a sphere. Find its volume.
20. Find the polar coordinates corresponding to the Cartesian coordinate $(-3, \sqrt{3})$.
21. Find a linearly independent eigenvectors of the matrix $\begin{bmatrix} 0 & 16 \\ 4 & 0 \end{bmatrix}$ and diagonalize it.
22. Prove that a square matrix A and its transpose A^T have the same characteristic roots.



UNIT – IV

Long essay type. Answer **any 2** questions. **Each** question carries **5** marks. (2×5=10)

23. Verify Euler's theorem on homogeneous functions for the function $u = (x^2 + y^2 + z^2)^{-1/3}$, with $x^2 + y^2 + z^2 \neq 0$.

24. Prove that $\int_0^1 x^{3/2}(1-x)^{3/2} dx = \frac{3\pi}{128}$.

25. Evaluate $\iiint_V (x^2 + y^2 + z^2) dx dy dz$ where V is the volume of the cube bounded by the coordinate planes and the planes $x = y = z = a$.

26. Find the characteristic roots of the matrix $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ and then verify Cayley Hamilton theorem. Also express $A^5 - 4A^4 - 7A^3 + 11A^2 - A - 10I$ as a linear polynomial in A .

