K25U 1325

Reg. No. : .....

Name : .....

Second Semester B.Sc. Degree (C.B.C.S.S. – OBE – Supplementary/ Improvement) Examination, April 2025
(2019 to 2023 Admissions)
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. Let $f(x, y) = x^2y + 1$. Find $f(2, 1)$.
2. Find $\lim_{(x,y)\to(3,4)} \sqrt{x^2 + y^2 - 1}$.
3. Evaluate $\int \cos^4 x \, dx$.
4. Define a circle in polar co-ordinates.
5. Define similarity transformation of 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 $f(x, y, z) = \frac{1}{xyz}$.
7. Find the value of f_x at the point $\left(2, \frac{\pi}{4}\right)$ if $f(x, y) = x \sin xy$.
8. Find $\frac{dw}{dt}$ if $w = xy + z$, $x = \cos t$, $y = \sin t$, $z = t$. What is the derivative's value at $t = \frac{\pi}{2}$.
9. Evaluate $\int_0^{\pi/6} \sin^6 3x dx$.

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10. Find $\int_0^{\frac{\pi}{2}} \cos^6 x \, dx$.

11. Find the volume of the solid generated by revolving the region between the y-axis and the curve $x = 2/y$, $1 \leq y \leq 4$, about the y-axis.

12. Find the area bounded between the curve $y = x^2$ above the x-axis and below the line $y = 2$.

13. When can you say that a quadratic form is negative definite ?

14. Find the eigen values of the matrix $\begin{bmatrix} 3 & 0 & 0 \\ 5 & 4 & 0 \\ 3 & 6 & 1 \end{bmatrix}$.

15. Show that the matrices $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 0 \\ 0 & 1 \end{bmatrix}$ are similar.

UNIT – III

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

16. Show that the function $f(x, y) = \log_e (1 + x^2 + y^2) + e^x \cos y$ is continuous everywhere in the plane.

17. If $I_n = \int_0^a (a^2 - x^2)^n \, dx$ and $n \neq 0$, prove that $I_n = \frac{2na^2}{2n+1} I_{n-1}$.

18. Evaluate $\int_0^{2a} x^3 (2ax - x^2)^{3/2} \, dx$.

19. The region between the curve $y = \sqrt{x}$, $0 \leq, x \leq 4$ and the x-axis is revolved about the x-axis to generate a solid. Find its volume.

20. Find a polar equation for the circle $x^2 + (y - 3)^2 = 9$.

21. Find a linearly independent eigen vectors of the matrix $\begin{bmatrix} 3 & 2 \\ -5 & -4 \end{bmatrix}$ and diagonalize it.

22. Prove that 0 is a characteristic root of a matrix if and only if the matrix is singular.

UNIT – IV

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

23. Show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2u \log u$ where $\log u = (x^3 + y^3)/(3x + 4y)$.

24. If $I_n = \int_0^{\pi/3} \tan^n x \, dx$ show that $(n-1)(I_n + I_{n-2}) = \left(\sqrt{3}\right)^{n-1}$.

25. Evaluate $\int_0^4 \int_0^{2\sqrt{z}} \int_0^{\sqrt{4z-x^2}} dz \, dx \, dy$.

26. If $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$ find A^2 using Cayley Hamilton theorem and then find A^3.