K25U 1322

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-ST : MATHEMATICS FOR STATISTICS – II

Time : 3 Hours Max. Marks : 40

SECTION – A

Answer **any 4** from the following 5 questions. **Each** question carries **1** mark **each** :

1. Given that $z = x^2 \sin(xy) + \cos(x^2 + y^2)$. Find $\frac{\partial^2 z}{\partial y \partial x}$.
2. Evaluate $\int \cos^3 x \sin x dx$.
3. Evaluate $\int_{-1}^{1}\int_{0}^{1}(x^2 + y^2)dxdy$.
4. Does the zero matrix is diagonal ? Justify your answer.
5. Does the function $u(x, y) = \sin^{-1}(x + y)$ is a homogeneous function ? Justify your answer. **(4×1=4)**

SECTION – B

Answer **any seven** questions from the following 10 questions. **Each** question carries **2** marks **each** :

6. Given that $p \neq 0$ is an eigen value of the matrix A, then show that p^{-1} is an eigen value of A^{-1}.
7. Given that $x = \sin t$, $y = \cos t$ and $z = x^2 + y^2$. Show that $\frac{dz}{dt} = 0$.
8. Show that function $f(x,y) = \frac{x+y}{x^2+y^2+1}$ is continuous at all points point of R^2.

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9. Evaluate $\int_0^{\pi/2} \cos^4 x dx$.
10. Evaluate $\int \tan^3 x \sec^3 x dx$.
11. Evaluate $\int_0^{\pi/4}\int_0^{\sin\theta} r\cos\theta \, dr \, d\theta$.
12. Evaluate $\int_R \int xydA$ where R is the region bounded by the parabola $y = x^2$ and the lines $x = 2$, $y = 0$.
13. Evaluate $\int_0^{\pi/2}\int_0^1\int_0^{x^2} x\cos y \, dzdxdy$.
14. Verify Cayley-Hamilton for the matrix $A = \begin{bmatrix} 1 & 0 \\ -2 & 3 \end{bmatrix}$.
15. Define the following terms : **(7×2=14)**
    i) Eigen values.
    ii) Eigen vectors.

SECTION – C

Answer **any four** questions from the following 7 questions. **Each** question carries **3** marks **each** :

16. Find the eigen vectors of the matrix $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$.
17. Using Cayley-Hamilton Theorem, find the inverse of the matrix $A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$.
18. Find the length of the curve $f(x) = x^2$ from $x = 0$ to $x = 1$.
19. Evaluate $\int \sec^4 x dx$.
20. Given that $u = x^3 + y^3 + x^2y + x^2y$. Show that $xu_x + yu_y = 3u$.
21. Find the domain and range of the function $f(x, y) = \sqrt{1 + x^2 + y^2}$.
22. Evaluate $\int \sin^2 x \cos^4 x dx$. **(4×3=12)**

SECTION – D

Answer **any two** questions. **Each** question carries **5** marks **each** :

23. Use cylindrical coordinates to evaluate $\int_{-3}^{3}\int_{-\sqrt{9-x^2}}^{\sqrt{9-x^2}}\int_0^{9-x^2-y^2} x^2 dzdydx$.
24. Given that $u = \frac{x^3 + y^3}{x^2 + y^2}$. Show that $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2} = 0$.
25. Reduce the matrix $A = \begin{bmatrix} 1 & 0 \\ 4 & 7 \end{bmatrix}$ to the diagonal form.
26. Derive the reduction formula for $\int \tan^n x dx$. **(2×5=10)**
