K22U 1298

Reg. No. : .....

Name : .....

II Semester B.Sc. Degree (C.B.C.S.S. – O.B.E. – Regular/Supplementary/ Improvement) Examination, April 2022
(2019 Admission Onwards)
COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS
2C02 MAT-CS: Mathematics for Computer Science – II

Time : 3 Hours

Max. Marks : 40

PART – A

Answer **any 4** questions : **(1×4=4)**

1. Evaluate $\int_0^{\frac{\pi}{2}} \cos^6 x \, dx$.
2. Graph the region between the parabola $y = 2 - x^2$ and the line $y = -x$.
3. Calculate the value of the integral $\int_1^2 \int_3^4 dxdy$.
4. Prove that the matrices A and A^T have the same eigenvalues.
5. Find the sum and product of eigenvalues of the matrix $\begin{bmatrix} 4 & 0 & 0 \\ 0 & -4 & 0 \\ 0 & 0 & 1 \end{bmatrix}$.

PART – B

Answer **any 7** questions : **(2×7=14)**

6. Find $\frac{du}{dt}$ when $u = x^2y^2 + x^3y$ where $x = 2t^2$ and $y = 4t$.
7. Find $\frac{dy}{dx}$, given $xe^{-y} - 2ye^x = 1$.
8. Let $f(x, y) = x^6 \log\left(\frac{y}{x}\right)$. Compute the value of $x\frac{\partial f}{\partial x} + y\frac{\partial f}{\partial y}$.

P.T.O.

9. Find the value of $\int_0^{\pi/8} \sin^3(4x)dx$.

10. Show that $\int_0^{\pi} \sin^6\theta.\cos^4\theta d\theta = \frac{3\pi}{256}$.

11. If $I_n = \int_0^{\pi/4} \tan^n x dx$, prove that $n(I_{n-1} + I_{n+1}) = 1$.

12. Evaluate the integral $\int_0^1 \frac{x^9}{\sqrt{1-x^2}} dx$.

13. Find all polar co-ordinates of the point P(5, π/3).

14. Find the average value of f(x, y)= xcos(xy) over the rectangle R : $0 \le x \le \pi$, $0 \le y \le 1$.

15. If λ is an eigenvalue of a matrix A, prove that λ + k is an eigenvalue of the matrix A + kI.

PART – C

Answer **any 4** questions : **(3×4=12)**

16. If $f(x, y) = \frac{x-y}{2x+y}$, show that $\lim_{x\to 0}\left[\lim_{y\to 0} f(x, y)\right] \neq \lim_{y\to 0}\left[\lim_{x\to 0} f(x, y)\right]$.

17. If $u = e^{x^2+y^2}$, show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 3u\log u$.

18. Using reduction formula, evaluate $\int \sin^4 x\, dx$.

19. Show that $\int_0^{2\pi} \sin^7\left(\frac{x}{4}\right)dx = \frac{64}{35}$.

20. Evaluate $\int_0^1\int_0^2 xy(x-y)dxdy$.

21. Find eigenvalues and eigenvectors of the matrix $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$.

22. Find the nature of the quadratic form $4x^2 + 3y^2 + z^2 - 8xy - 6yz + 4zx$.

PART – D

(5×2=10)

Answer **any 2** questions :

23. If $u = \sin^{-1}\left[\frac{x+y}{\sqrt{x}-\sqrt{y}}\right]$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\tan u$.

24. Evaluate $\int_0^{\pi/6} \sin^2 6\theta . \cos^4 3\theta \, d\theta$.

25. Show that $\int_{x=0}^{1}\int_{y=0}^{1-x} (x^2+y^2)dx\,dy = \frac{1}{6}$.

26. Using Cayley-Hamilton theorem, find the inverse of the matrix

$$A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}.$$