



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 $\int_1^2 \int_3^4 dx dy$.

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 $u = x^2 y^2 + x^3 y$ 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 $x \frac{\partial f}{\partial x} + y \frac{\partial f}{\partial y}$.

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9. Find the value of $\int_0^{\pi/8} \sin^3(4x)dx$.
10. Show that $\int_0^{\pi} \sin^6\theta \cdot \cos^4\theta d\theta = \frac{3\pi}{256}$.
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 $P(5, \pi/3)$.
14. Find the average value of $f(x, y) = x \cos(xy)$ over the rectangle $R: 0 \leq x \leq \pi, 0 \leq y \leq 1$.
15. If λ is an eigenvalue of a matrix A , prove that $\lambda + k$ is an eigenvalue of the matrix $A + kI$.

PART - C

Answer **any 4** questions :

(3x4=12)

16. If $f(x, y) = \frac{x-y}{2x+y}$, show that $\lim_{x \rightarrow 0} \left[\lim_{y \rightarrow 0} f(x, y) \right] \neq \lim_{y \rightarrow 0} \left[\lim_{x \rightarrow 0} f(x, y) \right]$.
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 $\int_0^2 \int_0^2 xy(x-y) dx dy$.
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

Answer **any 2** questions :

(5×2=10)

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

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

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