



K26U 0853

Reg. No. :

Name :

Second Semester B.Sc. Degree (C.B.C.S.S. – OBE-Supplementary)
Examination, April 2026
(2020 to 2023 Admissions)
COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS
2C02 MAT-ST : Mathematics for Statistics – II

Time : 3 Hours

Max. Marks : 40

PART – A

Short answer questions. Answer **any 4** from the following 5 questions. **Each** question carries **1** mark.

- Find $\frac{\partial z}{\partial x}$ if $z = x^2y - x \sin xy$.
- Verify Euler's theorem, when $f(x, y) = 3x^2yz + 5xy^2z + 4z^4$.
- Find $\int \sin^4 x \, dx$.
- Find $\int_0^{\frac{\pi}{2}} \sin^8 x \, dx$.
- Find eigen values of the matrix $\begin{bmatrix} 4 & 3 \\ 2 & 9 \end{bmatrix}$. (4×1=4)

PART – B

Short essay questions. Answer **any 7** from the following 10 questions. **Each** question carries **2** marks.

- Evaluate $\lim_{\substack{x \rightarrow 0 \\ y \rightarrow 0}} \frac{xy}{x^2 + y^2}$.
- If $u = x^y$, then show that $\frac{\partial^3 u}{\partial x^2 \partial y} = \frac{\partial^3 u}{\partial x \partial y \partial x}$.
- Find $\int_0^{\frac{\pi}{2}} \sin^6 3x$.
- Find $\int_0^{\frac{\pi}{2}} \sin^6 x \cos^8 x \, dx$.

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- Find $\int_0^1 \int_1^2 xy e^x \, dy \, dx$.
- Find the average value of $f(x, y) = x \cos xy$ over the rectangle $R : 0 \leq x \leq \pi, 0 \leq y \leq 1$.
- Sketch the region bounded by the lines $x = 0, y = 2x$ and $y = 4$.
- Verify Cayley Hamilton Theorem for the matrix $\begin{bmatrix} -2 & 4 \\ 3 & 5 \end{bmatrix}$.
- Find the characteristic equation of $A = \begin{bmatrix} 3 & 2 \\ 1 & 2 \end{bmatrix}$.
- Reduce the matrix $A = \begin{bmatrix} 1 & 1 \\ 0 & 2 \end{bmatrix}$ to the diagonal form. (7×2=14)

PART – C

Essay questions. Answer **any 4** from the following 7 questions. **Each** question carries **3** marks.

- If $u = x^2 \tan^{-1} \frac{y}{x} - y^2 \tan^{-1} \frac{x}{y}$, then show that $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$.
- If $v = (x^2 + y^2 + z^2)^{-\frac{1}{2}}$, then prove that $\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} + \frac{\partial^2 v}{\partial z^2} = 0$.
- Evaluate $\int_0^{\infty} \frac{1}{(x+x^2)^5} \, dx$.
- Evaluate $\int \tan^6 x \, dx$.
- Find the eigen vectors of the matrix $A = \begin{bmatrix} 1 & 4 \\ 3 & 2 \end{bmatrix}$.
- Determine the nature of the quadratic form $x^2 + 3y^2 - 3z^2 - 2xy$.
- Using Cayley Hamilton Theorem find the inverse of $A = \begin{bmatrix} 1 & 2 & -1 \\ 2 & 3 & 1 \\ 0 & 2 & 2 \end{bmatrix}$. (4×3=12)



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PART – D

Long Essay questions. Answer **any 2** from the following 4 questions. **Each** question carries **5** marks.

- Transform the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ into polar coordinates.
- Derive the reduction formula for $\int \cos^n x \, dx$.
- Evaluate $\int_0^3 \int_0^{\sqrt{9-x^2}} \int_0^{\sqrt{9-y^2}} dz \, dy \, dx$.
- Calculate A^4 if $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ using Cayley Hamilton Theorem. (2×5=10)