K26U 0856

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 – BCA : Mathematics for BCA – II

Time : 3 Hours Max. Marks : 40

PART – A

Answer **any four** questions. **(4×1=4)**

1. Evaluate $\lim_{\substack{x\to 1\\ y\to 2}} \frac{xy}{x^2+y^2}$.
2. $\int_0^{\pi/2} \cos^n x\, dx =$ _____
3. Write the equivalent cartesian equation of $r^2\cos^2\theta - r^2\sin^2\theta = 1$.
4. State Cayley-Hamilton theorem.
5. What can you say about the product of eigen values of a square matrix A ?

PART – B

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

6. Evaluate $\frac{\partial z}{\partial y}$ for $z = y \sin xy$.
7. If $z = x^2y + \cos y + y \sin x$, find $\frac{\partial^2 z}{\partial y \partial x}$.
8. Integrate $x^2 \cos x$.
9. Integrate $\tan x$.
10. Evaluate $\int_1^2 \int_0^4 2xy\, dy\, dx$.

P.T.O.

11. Find the polar coordinates, $0 \leq \theta \leq 2\pi$ and $r \geq 0$ of the point $(-3, 0)$.

12. Find the eigen values of the matrix $\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$.

13. Define eigen vectors.

14. Find the matrix corresponding to the quadratic form $x^2 + y^2 + 2xy + 2xz - 2yz$.

15. Prove that any square matrix and its transpose have the same eigen values.

PART – C

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

16. If $\theta = t^n e^{-\frac{r^2}{4t}}$, what value of n will make $\frac{1}{r^2}\frac{\partial}{\partial r}\left(r^2 \frac{\partial \theta}{\partial r}\right) = \frac{\partial \theta}{\partial t}$.

17. If $u = F(x - y, y - z, z - x)$, prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$.

18. Find $\int_0^{2a} x^m \sqrt{2ax - x^2}\, dx$.

19. Evaluate $\int \tan^6 x\, dx$.

20. Evaluate $\int\int_R y \sin(x + y)\, dA$, where $R : -\pi \leq x \leq 0, 0 \leq y \leq \pi$.

21. Find the volume of the prism whose base is the triangle in the xy plane bounded by the x-axis and the lines $y = x$ and $x = 1$ and whose top lies in the plane $z = 3 - x - y$.

22. Find the eigen vectors of $\begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{bmatrix}$.

PART – D

Answer **any 2** questions. **(2×5=10)**

23. If $x = e^{r\cos\theta}\cos(r\sin\theta)$ and $y = e^{r\cos\theta}\sin(r\sin\theta)$, show that $\frac{\partial^2 x}{\partial\theta^2} + r\frac{\partial x}{\partial r} + r^2\frac{\partial^2 x}{\partial r^2} = 0$.

24. Determine $\int_0^{\pi/2} \sin^p x \cos^q x\, dx$ where p and q are positive integers.

25. Find the volume of the region enclosed by surfaces $z = x^2 + 3y^2$ and $z = 8 - x^2 - y^2$.

26. Verify Cayley Hamilton theorem for the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ and hence obtain A^{-1}.
