K23U 1997

Reg. No. : .....

Name : .....

II Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/ Improvement) Examination, April 2023
(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 four** questions. (4×1=4)

1. Evaluate $\lim_{\substack{x\to 1\\ y\to 2}} \frac{2x^2y}{x^2+y^2+1}$.
2. Write the reduction formula for $\int \cos^n x\, dx$.
3. Write the equivalent polar equation of $xy = 4$.
4. State Cayley-Hamilton theorem.
5. State Euler's theorem on homogeneous functions.

PART – B

Answer **any 7** questions. (7×2=14)

6. Evaluate $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ for $z = x^2y - x\sin xy$.
7. Find $\frac{\partial^2 z}{\partial y \partial x}$ and $\frac{\partial^2 z}{\partial y^2}$ if $z = x^3 + y^3 - 3axy$.
8. Evaluate $\int_0^1 x^2(1-x^2)^{3/2}\, dx$.
9. Find $\int_0^{\pi/2} \sin^5 x \cos^6 x\, dx$.
10. Evaluate $\int \tan^3 x\, dx$.

P.T.O.

11. Evaluate $\int \sin^2 x \, dx$.

12. Find the area of the region bounded above by the curve $y = 2e^{-x} + x$, below by the curve $e^x/2$, on the left by $x = 0$, and on the right by $x = 1$.

13. Find the equivalent Cartesian equation of $r = \dfrac{4}{2\cos\theta - \sin\theta}$.

14. Find the sum and the product of the eigen values of $\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$.

15. Find the matrix corresponding to the quadratic form $x^2 + 5y^2 + z^2 + 2xy + 2yz + 6zx$.

PART – C

Answer any 4 questions. (4x3=

16. Find $\left(\dfrac{\partial}{\partial x} + \dfrac{\partial}{\partial y} + \dfrac{\partial}{\partial z}\right)^2 u$ if $u = \log(x^3 + y^3 + z^3 - 3xyz)$.

17. If $u = f(r)$ and $x = r\cos\theta$, $y = r\sin\theta$, prove that $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} = f''(r) + \dfrac{1}{r} f'(r)$.

18. If $I_n = \int_0^a (a^2 - x^2)^n \, dx$, and $n > 0$ prove that $I_n = \dfrac{2na^2}{2n+1} I_{n-1}$.

19. Evaluate $\int \sin^3 x \cos^2 x \, dx$.

20. Find the length of the curve $y = \left(\dfrac{x}{2}\right)^{2/3}$ from $x = 0$ to $x = 2$.

21. Evaluate $\int_1^4 \int_0^{\sqrt{x}} \dfrac{3}{2} e^{y/\sqrt{x}} \, dy \, dx$.

22. Find the eigen vectors of $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$.

PART – D

Answer **any 2** questions. (2×5=10)

23. Transform the equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ into polar coordinates.

24. If $\phi(n)=\int_0^{\pi/4}\tan^n x\,dx$, show that $\phi(n)+\phi(n-2)=\frac{1}{n-1}$ and deduce the value of $\phi(5)$.

25. Set up the limits of integration with the order of integration dy dz dx for evaluating the triple integral of a function. F(x, y, z) over the tetrahedron D with vertices (0, 0, 0), (1, 1, 0), (0, 1, 0), (0, 1, 1). Also integrate F(x, y, z) = 1 over D in the order dy dz dx.

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