

Reg. No. :

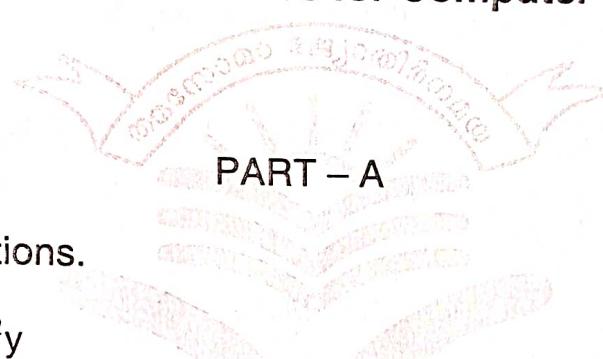
Name :

**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

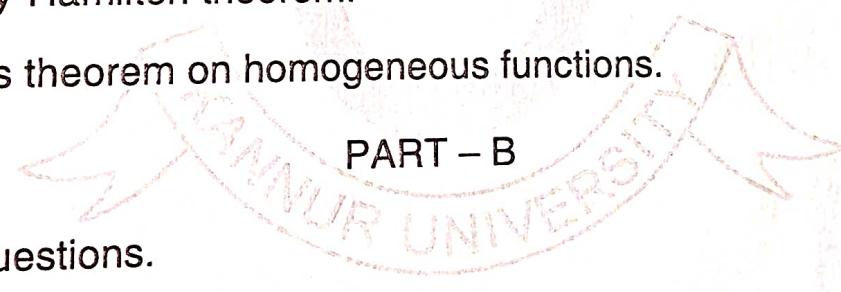


PART – A

Answer any four questions.

(4×1=4)

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



PART – B

Answer any 7 questions.

(7×2=14)

- Evaluate $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ for $z = x^2 y - x \sin xy$.
- Find $\frac{\partial^2 z}{\partial y \partial x}$ and $\frac{\partial^2 z}{\partial y^2}$ if $z = x^3 + y^3 - 3axy$.
- Evaluate $\int_0^1 x^2 (1-x^2)^{3/2} dx$.
- Find $\int_0^{\pi/2} \sin^5 x \cos^6 x dx$.
- 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 $r = \frac{4}{2\cos\theta - \sin\theta}$.
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 $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z} \right)^2 u$ 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 $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = f''(r) + \frac{1}{r} f'(r)$.
18. If $I_n = \int_0^a (a^2 - x^2)^n \, dx$, and $n > 0$ prove that $I_n = \frac{2na^2}{2n+1} I_{n-1}$.
19. Evaluate $\int \sin^3 x \cos^2 x \, dx$.
20. Find the length of the curve $y = \left(\frac{x}{2}\right)^{2/3}$ from $x = 0$ to $x = 2$.
21. Evaluate $\int_1^4 \int_0^{\sqrt{x}} \frac{3}{2} e^{y/\sqrt{x}} \, dy \, dx$.
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} .