K25U 1320

Reg. No. : ……………………………

Name : ……………………………

Second Semester B.Sc. Degree (CBCSS – OBE – Supplementary/ Improvement) Examination, April 2025
(2019 to 2023 Admissions)
COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS
2C02 MAT – PH : Mathematics for Physics – II

Time : 3 Hours   Max. Marks : 40

UNIT – I
(Short answer type)

Answer **any 4** questions. **Each** question carries **1** mark. **(4×1=4)**

1. Find the natural domain of the function $z=\sqrt{1-x^2-y^2}$.
2. Find the degree of the homogeneous function $f(x,y)=\frac{\sqrt{y}+\sqrt{x}}{y+x}$.
3. Evaluate $\int \sin^6 x\,dx$.
4. Find the Cartesian equivalent of the polar equation $r^2\cos\theta\sin\theta = 4$.
5. Define characteristic equation of the matrix A.

UNIT – II
(Short essay type)

Answer **any 7** questions. **Each** question carries **2** marks. **(7×2=14)**

6. Check the continuity of the function $f(x,y)=\frac{x+y}{x-y}$.
7. Verify Euler's theorem on homogeneous function for the function $u(x,y)=\sin\left(\frac{x-y}{x+y}\right)^{1/2}$.

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8. Use the chain rule to find the derivative of $w = xy$ with respect to θ along the path $x = \cos\theta$, $y = \sin\theta$.
9. Evaluate $\int_0^{\pi/2} \sin^7 x\,dx$.
10. Evaluate $\int_0^{\pi/2} \cos^6 x\,dx$.
11. Evaluate $\int_{-\pi/4}^{\pi/4} \tan x\,dx$.
12. Graph the sets of points whose polar coordinates satisfy the following conditions $-3 \le r \le 2$ and $\theta=\frac{\pi}{4}$.
13. Write the Cartesian equation of the polar equation $r^2 = 4r\cos\theta$.
14. Find the eigen values of the matrix $A=\begin{bmatrix}2 & 1\\ 1 & 2\end{bmatrix}$.
15. Give the matrix associated with the quadratic form $6x_1^2+17x_2^2+3x_3^2+2x_1x_3+14x_2x_3+20x_1x_2$.
16. Express of A^{-1} as a polynomial in A.

UNIT – III
(Essay type)

Answer **any 4** questions. **Each** question carries **3** marks. **(4×3=12)**

17. Describe the graph of the function $f(x, y) = 1 - x - y$.
18. Evaluate $\int_0^{\pi/4} (\cos 2\theta)^{3/2} \cos\theta\,d\theta$.
19. Show that $\int_0^1 x^{3/2}(1-x)^{3/2}\,dx=\frac{3\pi}{128}$.
20. Find the area of the surface generated by revolving about the x – axis, the portion in the first and second quadrants of the circle $x^2 + y^2 = a^2$.
21. Find the area of the region that lies inside the circle $r = 1$ and outside the cardioid $r = 1 - \cos\theta$.

22. Find the eigen values and corresponding eigen vectors of $A=\begin{bmatrix}1 & 1 & 2\\ 0 & 2 & 2\\ -1 & 1 & 3\end{bmatrix}$.
23. Prove that an eigen vector associated with the eigen value a_{jj} of the diagonal matrix is the column vector with 1 in row j and other elements zero.

UNIT – IV
(Long essay type)

Answer **any 2** questions. **Each** question carries **5** marks. **(2×5=10)**

24. If $\theta=t^n e^{-r^2/4t}$, what value of n will make $\frac{1}{r^2}\frac{\partial}{\partial r}\left(r^2\frac{\partial\theta}{\partial r}\right)=\frac{\partial\theta}{\partial t}$?
25. Evaluate $\int_0^a (a^2+x^2)^{5/2}\,dx$.
26. Find the area of surface generated by revolving the curve $y = 2\sqrt{x}$, $1 \le x \le 2$, about the x – axis.
27. Diagonalize the following matrix, if possible $A=\begin{bmatrix}1 & 3 & 3\\ -3 & -5 & -3\\ 3 & 3 & 1\end{bmatrix}$.

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