K23U 1993

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-PH : Mathematics for Physics – II

Time : 3 Hours

Max. Marks : 40

UNIT – I

Short answer type. Answer **any 4** questions.

1. Find $\frac{\partial z}{\partial x}$ if $z = 3^x$.
2. Evaluate $\int_0^4 \sqrt{y-2}\, dy$.
3. State Euler's theorem for homogeneous functions.
4. Evaluate $\int_0^{\frac{\pi}{4}} \cos^6 2t \, dt$.
5. Find the characteristic values of the matrix : $A = \begin{bmatrix} -1 & 0 \\ 0 & 2 \end{bmatrix}$. **(4×1=4)**

UNIT – II

Short essay type. Answer **any 7** questions.

6. Evaluate $\int_{-\pi/4}^{\pi/4} \tan x \, dx$.
7. Evaluate $\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y}$, if $z = x^2y - x \sin xy$.
8. If $z = \cos(x + ct)$, prove that $\frac{\partial^2 z}{\partial t^2} = c^2 \frac{\partial^2 z}{\partial x^2}$.
9. Verify Cayley Hamilton theorem for the matrix $= \begin{bmatrix} 2 & 4 \\ 0 & 1 \end{bmatrix}$.

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10. Find the characteristic equation of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$.

11. Evaluate $\int \frac{x^4 dx}{\sqrt{a^2 - x^2}}$.

12. Evaluate $\int \frac{\sin^4\theta}{\cos^2\theta} d\theta$.

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

14. Set up the integral for finding the length of the curve $y = \sin x$, $0 \le x \le 2\pi$.

15. If $u = \sin^{-1} \frac{x+2y+3z}{x^8 + y^8 + z^8}$, find the value of $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z}$.

16. Define the eigen vectors of a matrix. **(7×2=14)**

UNIT – III

Essay type. Answer **any 4** questions.

17. Find the volume of the solid generated by revolving the region bounded by $y = \sqrt{x}$ and the lines $y = 1$, $x = 4$ about the line $y = 1$.

18. Find the area of the region R enclosed by the parabola $y = 2 - x^2$ and $y = -x$.

19. Evaluate $\int_0^{2a} x^3 \left(2ax - x^2\right)^{3/2} dx$.

20. Evaluate $\int \sec^{2/3} x \ \text{cosec}^{4/3} x \ dx$.

21. Find the inverse matrix of $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$.

22. Find the matrix P which transforms the matrix $= \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ to the diagonal form.

23. If $u = x^y$, show that $\frac{\partial^3 u}{\partial x^2 \partial y} = \frac{\partial^3 u}{\partial x \partial y \partial x}$. **(4×3=1**

UNIT – IV

Long essay type. Answer **any 2** questions.

24. If $u = \left(\frac{y-x}{xy}, \frac{z-x}{xz}\right)$, show that $x^2\frac{\partial u}{\partial x} + y^2\frac{\partial u}{\partial y} + z^2\frac{\partial u}{\partial z} = 0$.

25. a) Find the length of the cardioid $r = 1 - \cos\theta$.

b) Find the area of the region in the plane enclosed by the cardioid $r = 1 + \cos\theta$.

26. Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$.

27. Evaluate $\int_0^{\frac{\pi}{2}} \sin^p x \cos^q x dx$.

(2×5=10)

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