



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 $\int_0^{\pi} \cos^6 2t dt$.

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 $y = \sin x$, $0 \leq x \leq 2\pi$.
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 $\int_0^{2a} x^3 (2ax - x^2)^{3/2} dx$.
20. Evaluate $\int \sec^{2/3} x \operatorname{cosec}^{4/3} x dx$.
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=12)



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)
