



K20U 0469

Reg. No. :

Name :

**II Semester B.Sc. Degree CBCSS (OBE)-Regular Examination, April 2020
(2019 Admission)**

**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 $z = \tan^{-1}(xy) + \tan(xy)$.
2. State Euler's theorem on homogeneous functions.
3. Evaluate $\int_0^{\pi/2} \sin^5 x \, dx$.
4. Find the area bounded by $y = x^2$, x axis and the line $x = 2$.
5. State Cayley-Hamilton theorem. (4×1=4)

UNIT – II

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

6. Evaluate $\lim_{x,y \rightarrow 0} \frac{xy}{x^2 + y^2}$ if limit exists.
7. Evaluate $\int \sin^3 x \, dx$.
8. If $u = x^2y$, $x = t^2$, $y = 2t$, find $\frac{du}{dt}$.
9. Evaluate $\int_0^1 \frac{x^5}{\sqrt{1-x^2}} \, dx$.

10. Evaluate $\int \sin^3 x \cos^2 x \, dx$.
11. Write the reduction formula for $\int \tan^n x \, dx$.
12. Evaluate $\int \sec^3 x \, dx$.
13. Find the area between $y^2 = x$ and $y = x^2$.
14. Find the volume of the solid generated by revolving $y = \sqrt{x}$, $0 \leq x \leq 4$ about x axis.
15. Find the eigenvalue of $\begin{bmatrix} 4 & 3 \\ 2 & 9 \end{bmatrix}$.
16. Using Cayley Hamilton theorem, find the inverse of $\begin{bmatrix} 5 & 3 \\ 3 & 2 \end{bmatrix}$. **(7×2=14)**

UNIT – III

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

17. If $u = \frac{x}{y+z} + \frac{y}{z+x} + \frac{z}{x+y}$, show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 0$.
18. Find the value of $\frac{du}{dt}$ given that $u = y^2 - 4ax$, $x = at^2$, $y = 2at$.
19. Reduce the quadratic form $2xy + 2yz + 2zx$ into canonical form.
20. Find the area of surface generated by revolving $y = x^2$, $0 \leq x \leq 2$ about x-axis.
21. Find the length of the cardioid $r = 1 - \cos \theta$.
22. Find the eigenvectors of $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.
23. Verify Cayley Hamilton theorem for $A = \begin{bmatrix} 4 & -2 \\ -3 & 5 \end{bmatrix}$. **(4×3=12)**

UNIT – IV

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

24. If $u = \sin^{-1} \left(\frac{x^2 + y^2}{x + y} \right)$, prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \tan u$.
25. Derive the formula for $\int_0^{\frac{\pi}{2}} \sin^p x \cos^q x \, dx$. Hence evaluate $\int_0^{\infty} \frac{x^3}{(1+x^2)^2} \, dx$.
26. Find the area of the region in the plane enclosed by the cardioid $r = 2(1 + \cos \theta)$.
27. Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ to the canonical form and specify the matrix of transformation. **(2×5=10)**