**K20U 0469**

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 $\dfrac{\partial z}{\partial x}$ if $z = \tan^{-1}(xy) + \tan(xy)$.

2. State Euler's theorem on homogeneous functions.

3. Evaluate $\displaystyle\int_{0}^{\frac{\pi}{2}} \sin^5 x \, dx$.

4. Find the area bounded by $y = x^2$, x axis and the line $x = 2$.

5. State Cayley-Hamilton theorem.

$(4\times1=4)$

## UNIT – II

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

6. Evaluate $\displaystyle\lim_{x, y \to 0} \frac{xy}{x^2 + y^2}$ if limit exists.

7. Evaluate $\displaystyle\int \sin^3 x \, dx$.

8. If $u = x^2y$, $x = t^2$, $y = 2t$, find $\dfrac{du}{dt}$.

9. Evaluate $\displaystyle\int_{0}^{1} \frac{x^5}{\sqrt{1-x^2}} \, dx$.

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 $y = \sqrt{x}, 0 \le x \le 4$ 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 $u = \dfrac{x}{y+z} + \dfrac{y}{z+x} + \dfrac{z}{x+y}$, show that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} + z\dfrac{\partial u}{\partial z} = 0$.

18. Find the value of $\dfrac{du}{dt}$ 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 $y = x^2, 0 \le x \le 2$ 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 $u = \sin^{-1}\left(\dfrac{x^2 + y^2}{x + y}\right)$, prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = \tan u$.

25. Derive the formula for $\int_{0}^{\frac{\pi}{2}} \sin^p x \cos^q x \, dx$. Hence evaluate $\int_{0}^{\infty} \dfrac{x^3}{(1+x^2)^2} \, dx$.

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)**