



Reg. No. : MG19CPHR04.....

K20U 0469

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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  $\int_0^{\frac{\pi}{2}} \sin^5 x \, dx$ .

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

✓5. State Cayley-Hamilton theorem.

(4×1=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  $\int_0^1 \frac{x^5}{\sqrt{1-x^2}} \, dx$ .

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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  $\begin{bmatrix} 5 & 3 \\ 3 & 2 \end{bmatrix}$ . (7x2)

## 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  $A = \begin{bmatrix} 4 & -2 \\ -3 & 5 \end{bmatrix}$ . (4x3)





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)**

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