Reg. No. : ....

Name : ....

II Semester B.Sc. Degree (C.B.C.S.S. – O.B.E. – Regular/Supplementary/ Improvement) Examination, April 2022
(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 $\dfrac{\partial z}{\partial x}$ if $z = \cos(x^3 y) + 2x^2 y^2$.

2. Find the characteristic polynomial of $A = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$.

3. Evaluate $\int_0^{\frac{\pi}{2}} \sin x \cos x \, dx$.

4. Find the area bounded by $y = 2x^3$, x axis and the line $x = 3$.

5. State Cayley – Hamilton theorem.　　　　　　　　　　　　**(4×1=4)**

UNIT – II

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

6. Evaluate $\displaystyle \lim_{(x,y) \to (0,0)} \dfrac{x^2 - y^2}{x + y}$.

7. Evaluate $\int \cos^3 x \, dx$.

8. If $u = x^3 y^4$, $x = t^3$, $y = 2t$, find $\dfrac{du}{dt}$.

9. Evaluate $\displaystyle \int_0^1 \dfrac{2x - 4}{\sqrt{1 + x^2}} \, dx$.

P.T.O.

10. Evaluate $\int \cos^4 x \sin^3 x \, dx$.

11. Write the reduction formula for $\int \tan^n x \, dx$.

12. Find the area between $y = 4x$ and $y = x^2$.

13. Find the volume of the solid generated by revolving $y = x^{\frac{1}{2}}$, $0 \le x \le 4$ about X axis.

14. Find the eigen value of $\begin{bmatrix} 3 & 3 \\ 4 & 1 \end{bmatrix}$.

15. Reduce the matrix $A = \begin{bmatrix} 2 & 5 \\ 0 & 6 \end{bmatrix}$ to the diagonal form.

16. Reduce the quadratic form $5xy + 2yz + zx$ into canonical form. **(7×2=14)**

UNIT – III

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

17. If $u = \dfrac{x}{x+z} + \dfrac{y}{y+x} + \dfrac{z}{z+y}$, find $\dfrac{\partial u}{\partial x} + \dfrac{\partial u}{\partial y} + \dfrac{\partial u}{\partial z}$.

18. Find the value of $\dfrac{du}{dt}$ given that $u = y - 2ax + 2$, $x = at^3$, $y = at$.

19. Evaluate $\int \sec^4 x \, dx$.

20. Find the area of surface generated by revolving $y = x^2$, $0 \le x \le 3$ about X axis.

21. Find the length of the cardioid $r = 2 - 3\cos\theta$.

22. Find the eigen vector of $A = \begin{bmatrix} 4 & 3 \\ 2 & 2 \end{bmatrix}$.

23. Verify Cayley Hamilton theorem for $A = \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$. **(4×3=12)**

UNIT – IV

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

24. Find $\int_0^{\pi 2} x \sin^6 x \cos^4 x \, dx$.

25. If $\phi(n) = \int_0^{\pi 4} \tan^n x \, dx$, show that $\phi(n) + \phi(n-2) = \dfrac{1}{n-1}$ and deduce the value of $\phi(5)$.

26. Find the area of the region in the plane enclosed by the cardioid $r = 2(1 - \cos\theta)$.

27. Reduce the quadratic form $2x^2 + 4y^2 + 2z^2 - 5yz + 4zx - 3xy$ to the canonical form and specify the matrix of transformation.

(2×5=10)