K19U 0266

Reg. No. : ....

Name : ....

II Semester B.Sc. Degree (CBCSS-Reg./Supple./Improv.) Examination, April 2019
(2014 Admission Onwards)
COMPLEMENTARY COURSE IN MATHEMATICS
2C02 MAT-PH : Mathematics for Physics and Electronics – II

Time : 3 Hours Max. Marks : 40

SECTION – A

All the **first 4** questions are **compulsory**. They carry **1** mark **each**.

1. One arch of the sine curve y = sin x revolves round the x – axis. Find the volume of the solid so generated.

2. Evaluate $\int_0^2 \int_0^{x^2} xy \, dy \, dx$.

3. Give example of an upper triangular matrix which is not lower triangular.

4. What can you say about the determinant of an orthogonal matrix ?

SECTION – B

Answer **any 7** questions from among the questions **5** to **13**. These questions carry **2** marks **each**.

5. Obtain the intrinsic equation of the cardioide r = a(1 – cosθ), taking pole as the fixed point.

6. Find the value of $\int_0^\infty \frac{dx}{(1+x^2)^4}$.

P.T.O.

7. The area included between the curves $y^2 = x^3$ and $x^2 = y^3$ is rotated about the x – axis. Find the volume of the solid generated.

8. Find the inverse of the matrix $\begin{bmatrix} \cos 2\theta & \sin 2\theta \\ -\sin 2\theta & \cos 2\theta \end{bmatrix}$.

9. Determine whether the set of vectors [3, 2, 1], [0, 0, 0], [4, 3, 6] is linearly independent or not ?

10. Solve the following system or indicate the non existence of solutions.
$2x + y - 3z = 8$
$5x + 2z = 3$
$8x - y + 7z = 0$

11. Use Cayley-Hamilton theorem to find A^4, where $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.

12. Give an example of a 2 × 2 matrix with real eigen values but is not symmetric.

13. Find the spectrum of the matrix $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$.

SECTION – C

Answer **any 4** questions from among the questions **14** to **19**. These questions carry **3** marks **each**.

14. Find the area bounded by the curve $xy^2 = 4a^2(2a - x)$ and its asymptote.

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

16. Find the surface of the solid generated by the revolution of the astroid $x^{2/3} + y^{2/3} = a^{2/3}$ about the x – axis.

17. Show by double integration that the area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ is $\frac{16}{3}a^2$.

18. Solve by Cramers rule :

$3y + 4z = 14.8$

$4x + 2y - z = -6.3$

$x - y + 5z = 13.5$.

19. Find all eigenvalues of $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$. For each eigenvalue of A, determine its algebraic multiplicity and geometric multiplicity.

SECTION – D

Answer **any 2** questions from among the questions **20** to **23**. These questions carry **5** marks **each**.

20. Find the whole length of the curve $x^2(a^2 - x^2) = 8a^2y^2$.

21. Evaluate $\iiint_V (2x + y)\,dx\,dy\,dz$, where V is the closed region bounded by the cylinder $z = 4 - x^2$ and the planes $x = 0$, $y = 0$, $y = 2$ and $z = 0$.

22. Find the inverse of the matrix $\begin{bmatrix} 1 & 2 & -9 \\ -2 & -4 & 19 \\ 0 & -1 & 2 \end{bmatrix}$, by Gauss-Jordan elimination.

23. Find the eigenbasis and diagonalize the matrix, $A = \begin{bmatrix} -6 & -6 & 10 \\ -5 & -5 & 5 \\ -9 & -9 & 13 \end{bmatrix}$.
