K19U 0269

Reg. No. : ....

Name : ....

II Semester B.Sc. Degree (CBCSS – Reg./Supple./Improv.) Examination, April 2019
(2014 Admission Onwards)
COMPLEMENTARY COURSE IN MATHEMATICS
2C02 MAT – CS : Mathematics for Computer Science – II

Time : 3 Hours Max. Marks : 40

SECTION – A

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

1. Give the reduction formula for $\int \sin^n x \, dx$.

2. Evaluate $\int_0^{\pi/2} \sin^5 x \cos^3 x \, dx$.

3. What are skew symmetric matrices ?

4. What can you say about the main diagonal entries of a skew-symmetric matrix ?

SECTION – B

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

5. Find the area of the ellipse, x = a cos t, y = b sin t.

6. Change the order of integration in $\int_0^{\infty} \int_x^{\infty} \frac{e^{-y}}{y} \, dx \, dy$, and hence find its value.

7. Evaluate $\int_0^{\pi} \int_0^{a\theta} r^3 \, d\theta \, dr$.

P.T.O.

8. If $A = \begin{bmatrix} 1 & 4 \\ 2 & 5 \\ 3 & 6 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ and $C = \begin{bmatrix} 2 & 0 \\ 0 & 3 \end{bmatrix}$, find AB and AC.

9. Determine the rank of the matrix, $A = \begin{bmatrix} 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \\ 2 & 1 & 3 & 1 \end{bmatrix}$.

10. Evaluate the determinant $\begin{vmatrix} 2 & 0 & -4 & 6 \\ 4 & 5 & 1 & 0 \\ 0 & 2 & 6 & -1 \\ -3 & 8 & 9 & 1 \end{vmatrix}$.

11. Show by example that orthogonal matrices need not be symmetric.

12. Obtain the characteristic polynomial of $\begin{bmatrix} -1 & -3 \\ 4 & 3 \end{bmatrix}$.

13. Let A be an idempotent matrix, meaning $A^2 = A$. Show that $\lambda = 0$ or $\lambda = 1$ are the only possible eigen values of A.

SECTION – C

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

14. Evaluate $\int_0^a \frac{x^4\,dx}{\sqrt{a^2 - x^2}}$.

15. Obtain the intrinsic equation of the catenary $y = a \cosh(x/a)$, taking the vertex (0, a) as the fixed point.

16. Show that the surface of the solid obtained by revolving the arc of the curve $y = \sin x$ from $x = 0$ to $x = \pi$ about the x – axis is $2\pi\,[\sqrt{2} + \log(1 + \sqrt{2})]$.

17. Prove that the surface generated by the revolution of the tractrix $x = a\cos t + \frac{1}{2} a \log \tan^2 t/2$, $y = a \sin t$ about its asymptote is equal to the surface of sphere of radius a.

18. Solve the system by using Cramer's rule :

$$\begin{aligned} x - y + 2z &= -4 \\ 3x + y - 4z &= -6 \\ 2x + 3y - 4z &= 4. \end{aligned}$$

19. Find all eigen values of $\begin{bmatrix} 1 & 0 & 0 \\ 1 & 2 & 2 \\ 1 & 1 & 1 \end{bmatrix}$.

SECTION – D

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

20. Prove that the area of the region bounded by the curve $a^4y^2 = x^5(2a - x)$, is to that of the circle whose radius is, a, is 5 to 4.

21. Evaluate $\iint_A r^2 \sin\theta \, d\theta \, dr$ over the area of cardioide $r = a(1 + \cos\theta)$ above the initial line.

22. Consider $A = \begin{bmatrix} 0 & 1 & 1 \\ 2 & 3 & -1 \\ -1 & 2 & 1 \end{bmatrix}$. Use the Gauss-Jordan elimination approach to obtain A^{-1}.

23. Diagonalize the following matrix, if possible

$$A = \begin{bmatrix} 1 & -1 & -1 \\ 1 & 3 & 1 \\ -3 & 1 & -1 \end{bmatrix}.$$