Reg. No. : ....

Name : ....

K21U 3614

II Semester B.Sc. Degree (CBCSS – Supple.) Examination, April 2021
(2014-2018 Admission)
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 $\int \tan^n x dx$.
2. If the two curves $y_1 = \phi_1(x)$ and $y_2 = \phi_2(x)$ intersect at (a, c) and (b, d) and lie between these points, then what is the area between these curves ?
3. Give an example for a 3×3 upper triangular matrix.
4. If $A = A^T$, then it is said to be a ________ matrix.

SECTION – B

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

5. Evaluate $\int \text{cosec}^5 dx$.
6. Find the whole area included between the curve $x^2y^2 = a^2(y^2 - x^3)$ and its asymptotes.
7. Find the perimeter of the cardioid $r = a(1 - \cos\theta)$.
8. Find the volume of the solid generated by the revolution of the tractrix $x = a\cos t + \frac{1}{2}\log\tan^2\frac{t}{2}$, $y = a\sin t$ about its asymptotes.

P.T.O.

9. Evaluate $\int_0^{\pi}\int_0^{x} \sin y \, dy \, dx$.

10. Find the volume of the solid whose base is in the xy-plane and is the triangle bounded by the x-axis, the line $y = x$ and the line $x = 1$ while the top of the solid is in the plane $z = x + y + 1$.

11. Let A be a 2×2 matrix. If it is symmetric as well as skew symmetric, then what is A and why ?

12. Are the vectors (1, 2), (3, 4) linearly independent ? Why ?

13. If A, B are both orthogonal, then what we can say about AB ? Why ?

SECTION – C

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

14. If $I_n = \int_0^a (a^2 - x^2)^n dx$ and $n \neq 0$ prove that $I_n = \frac{2na^2}{2n+1} I_{n-1}$.

15. Find the perimeter of the loop of the curve $9ay^2 = (x - 2a)(x - 5a)^2$.

16. Find the rank of $A = \begin{pmatrix} 1 & 3 & 1 \\ 2 & 5 & 3 \\ 3 & 1 & 1 \end{pmatrix}$ by row reduction.

17. For the orthogonal matrix $A = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$, verify that $A^{-1} = A^T$.

18. Verify the Cayley-Hamilton theorem for $A = \begin{pmatrix} 2 & 1 \\ 0 & 3 \end{pmatrix}$.

19. Consider the systems of linear equations :
$x + y = 3$, $4x + 3y = 4$ and 1
$5x + 4y = 7$, $9x + 7y = 11$. Are they row equivalent ? Why ? 2

SECTION – D

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

20. Find the ratio of the two parts into which the parabola $2a = r(1 + \cos\theta)$ divides the area of the cardioid $r = 2a(1 + \cos\theta)$.

21. If the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ revolves about the x-axis, show that the volume included between the surface thus generated, the cone generated by the asymptote and two planes perpendicular to the axis of x, at a distance h apart is equal to that of a circular cylinder of height h and radius b.

22. Solve the system of linear equations :

    $2a + 3b + 4c + 5d = 6$

    $a - b + 2c - 4d = 4$

    $a + c - 8d = 5$

    by row reduction. How many solutions the system have ? Why ?

23. Diagonalize the matrix $A = \begin{pmatrix} -6 & 4 \\ 3 & 5 \end{pmatrix}$.