K20U 0314

Reg. No. : ....

Name : ....

II Semester B.Sc. Degree (CBCSS – Supplementary/Improvement) Examination, April 2020
(2014-2018 Admissions)
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 formula for the length of the curve $y = f(x)$ between $x = 1$ and $x = b$.
2. What is the volume of a solid obtained by revolving $y = 1$ about x-axis between $x = 0$ and $x = 1$?
3. Give an example for a symmetric matrix.
4. State the Cayley-Hamilton theorem.

SECTION – B

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

5. Evaluate $\int_0^{\pi/6} \cos^6 3\theta \sin^2 6\theta \, d\theta$.
6. Find the area of a loop of the curve $r^2 = a^2 \cos 2\theta$.
7. Find the length of the arc of the parabola $x^2 = 4ay$ measured from the vertex to one extremity of the latus rectum.
8. 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.

P.T.O.

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

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

11. For 2 × 2 matrices A, B, if AB = I, is it necessary that BA = I ? If yes, give reason. If no, give an example.

12. Find a matrix A such that $A^2 = I$, but $A \neq I$.

13. Verify Cayley- Hamilton theorem for $A = \begin{pmatrix} 1 & 8 \\ 2 & 0 \end{pmatrix}$.

SECTION – C

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

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

15. Find the surface generated by the revolution of an arc of the catenary $y = c \cosh \frac{x}{c}$ about the x-axis.

16. By row reduction, check whether the vectors (1, 2,1), (2, – 3, 1), (5, 3, 4) are linearly independent.

17. Show that the matrix $\begin{pmatrix} \cos\theta & \sin\theta \\ \sin\theta & -\cos\theta \end{pmatrix}$ is orthogonal. Can you find one more orthogonal matrix using this matrix ? Give it.

18. For a 3 × 3 matrix A prove that $A - A^T$ is skew-symmetric without using the properties of transposes.

19. If $A = \begin{pmatrix} -6 & 4 \\ 3 & 5 \end{pmatrix}$ find A^{-1}.

SECTION – D

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

20. Show that the area common to the ellipses $a^2 x^2 + b^2 y^2 = 1$ and $b^2x^2 + a^2 y^2 = 1$ where $0 < a < b < 1$ is $\frac{4}{ab}\tan^{-1}\frac{a}{b}$.

21. Find the volume of the solid obtained by revolving the lemniscate $r^2 = a^2 \cos 2\theta$ about the initial line.

22. Solve the system of linear equations

    $2x - y + z = 1$

    $5x - 2y + az = b$

    $10x - 4y + 3z = 5$

    For which values of a, b the system has a unique solution ? For which values it has infinitely many solutions ?

23. Find eigen values and corresponding eigen vectors of the matrix $A = \begin{pmatrix} 3 & 2 \\ 3 & 4 \end{pmatrix}$.