K20U 0312

II Semester B.Sc. Degree (CBCSS – Supplementary/Improvement)
Examination, April 2020
(2014-2018 Admissions)
COMPLEMENTARY COURSE IN MATHEMATICS
2C02 MAT-CH : Mathematics for Chemistry – II

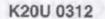Time : 3 Hours

Max. Marks : 40

SECTION – A

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

1. Evaluate $\int_0^{\frac{\pi}{2}} \sin^7 x \, dx$.

2. Find the volume generated by revolving an area bounded by the curve $y = f(x)$ and between two co-ordinates $y = a$ and $y = b$ about the y-axis.

3. Give an example of a skew-symmetric matrix.

4. Evaluate $\begin{vmatrix} \cosh t & \sinh t \\ \sinh t & \cosh t \end{vmatrix}$.

SECTION – B

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

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

6. Find the area bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

7. Evaluate $\int_0^{\frac{\pi}{2}} \sin^3 \theta \cos^4 \theta \, d\theta$.

8. Find the area of the surface generated by resolution of an arc of $y = c \cosh \dfrac{x}{c}$ about the x-axis.

9. Evaluate $\displaystyle\int_{1}^{\sqrt{2}}\int_{-\sqrt{4-2y^2}}^{\sqrt{4-2y^2}} y\, dx\, dy$.

10. Find the Jacobian $\dfrac{\partial(x,y)}{\partial(u,v)}$, where $x = \dfrac{1}{2}(u+v)$ and $y = \dfrac{1}{2}(u-v)$.

11. Find the inverse of $A = \begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$.

12. Find the eigen values of $A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$.

13. Given $A = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 1 & 1 \\ 2 & 3 & 1 \end{bmatrix}$, using Cayley Hamilton theorem find A^3.

SECTION – C

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

14. Find the length of the astroid $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$.

15. Find the volume of the solid obtained by revolving the ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$ about the x-axis.

16. Using Gauss-Jordan elimination, find the inverse of $A = \begin{bmatrix} -4 & 0 & 0 \\ 0 & 8 & 13 \\ 0 & 3 & 5 \end{bmatrix}$.

17. Using Cramer's rule, solve
$2x - 4y = -24$
$5x + 2y = 0$.

18. Find out what kind of conic section is given by the quadratic form
$Q = 7x_1^2 + 6x_1 x_2 + 7x_2^2 = 200$.

19. Given $A = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 1 & 1 \\ 2 & 3 & 1 \end{bmatrix}$, using Cayley Hamilton theorem find A^{-1}.

SECTION – D

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

20. Find the intrinsic equation of the cardioid $r = a(1 - \cos\theta)$ taking pole as the fixed point.

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

22. Solve the system of equations :
$8y + 6z = -4$
$-2x + 4y - 6z = 18$
$x + y - z = 2$.

23. Diagonalize $A = \begin{bmatrix} 6 & 0 & 0 \\ 12 & 2 & 0 \\ 21 & -6 & 9 \end{bmatrix}$.