



K17U 1038



Reg. No. :

Name :

II Semester B.Sc. Degree (C.B.C.S.S. – Reg./Supple./Imp.)
Examination, May 2017
COMPLEMENTARY COURSE IN MATHEMATICS
2C02 MAT-CH : Mathematics for Chemistry – II
(2014 Admn. Onwards)

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. Give an example of a 3×3 skew symmetric matrix.
3. Give a basis for the vector space \mathbb{R}^3 .
4. Define similar matrices.

(1×4=4)

SECTION – B

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

5. Evaluate $\int_0^a \frac{x^4 dx}{\sqrt{a^2 - x^2}}$.
6. Find the area of the loop of the curve $r^2 = a^2 \cos 2\theta$.
7. Find the whole length of the astroid $x^{2/3} + y^{2/3} = a^{2/3}$.
8. Find the volume of the solid obtained by revolving the ellipse $x^2/a^2 + y^2/b^2 = 1$ about the axis of x.

P.T.O.



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

10. Find the inverse of $\begin{bmatrix} -0.5 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 1 \end{bmatrix}$.

11. Find the spectrum of $\begin{bmatrix} -5 & 2 \\ 2 & -2 \end{bmatrix}$.

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

13. If $A = \begin{bmatrix} 1 & 3 \\ 2 & 6 \end{bmatrix}$, find A^2 using Cayley-Hamilton theorem. (2x7=14)

SECTION - C

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

14. Evaluate $\int \frac{\sin^4 x}{\cos^2 x} \, dx$.

15. Find the volume of the solid obtained by revolving the cardioid $r = a(1 + \cos \theta)$ about the initial line.

16. Evaluate $\iint xy(x+y) \, dx \, dy$ over the area between $y = x^2$ and $y = x$.

17. Solve : $0.8x + 1.2y - 0.6z = -7.8$

$$2.6x + 1.7z = 15.3$$

$$4.0x - 7.3y - 1.5z = 1.1$$



18. Find the inverse of the matrix :

$$\begin{bmatrix} 7 & -3 & -3 \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix}$$

19. Find the eigen values and eigen vectors of

$$\begin{bmatrix} 13 & 5 & 2 \\ 2 & 7 & -8 \\ 5 & 4 & 7 \end{bmatrix}$$

(3x4=12)

SECTION - D

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

20. Find the intrinsic equation of the curve $x = at^2$, $y = 2at$.

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. Show that the inverse of an $n \times n$ matrix A exists if and only if $\text{rank } A = n$.

23. Diagonalize the matrix : $\begin{bmatrix} 7.3 & 0.2 & -3.7 \\ -11.5 & 1.0 & 5.5 \\ 17.7 & 1.8 & -9.3 \end{bmatrix}$. (5x2=10)