M 8871

II Semester B.Sc. Degree (CCSS – 2014 Admn. – Regular)
Examination, May 2015
COMPLEMENTARY COURSE IN MATHEMATICS
2 C02 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 $\int_{0}^{\pi/2} \cos^8 x \, dx$.

2. Give an example of a diagonal matrix which is not a scalar matrix.

3. Find the rank of the matrix $\begin{bmatrix} 8 & 4 \\ -2 & -1 \\ 6 & 3 \end{bmatrix}$.

4. Define orthogonal matrices. $(4\times1=4)$

SECTION – B

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

5. Evaluate $\int \tan^6 x \, dx$.

6. Find the area of the ellipse $x = a \cos t$, $y = b \sin t$.

7. Find the perimeter of the cardioid $\gamma = a(1 - \cos\theta)$.

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.

9. Evaluate : $\int\limits_{0}^{1}\int\limits_{0}^{1}\dfrac{dx\,dy}{\sqrt{1-x^2}\,\sqrt{1-y^2}}$.

10. Find the inverse of the matrix $\begin{bmatrix} 3 & -1 \\ 1 & 2 \end{bmatrix}$.

11. Find the eigenvector of the matrix $\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$.

12. Show that the eigen values of a diagonal matrix are the same as its diagonal elements.

13. Using Cayley-Hamilton theorem show that

$A^3 = 5A + 2I$ where $A = \begin{bmatrix} 3 & -1 \\ 2 & -1 \end{bmatrix}$.

$(7\times2=14)$

SECTION – C

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

14. Find the area of the region lying above x – axis and included between the circle $x^2 + y^2 = 2ax$ and the parabola $y^2 = ax$.

15. The loop of the curve $2ay^2 = x\,(x-a)^2$ revolves about the straight line $y = a$. Find the volume of the solid generated.

16. Find by double integration the area of the region enclosed by curves $x^2 + y^2 = a^2$, $x + y = a$ in the first quadrant.

17. Solve by Gauss elimination method.

$2x - y + z = 7$

$3x + y - 5z = 13$

$x + y + z = 5.$

18. Find the inverse of matrix $\begin{bmatrix} 3 & -4 & 2 \\ 0 & 5 & 9 \\ -4 & 8 & 1 \end{bmatrix}$.

19. Find the eigen values of the matrix $\begin{bmatrix} 6 & 2 & -2 \\ 2 & 5 & 0 \\ -2 & 0 & 7 \end{bmatrix}$.

$(4\times3=12)$

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 Lparabola $y^2 = 4ax$, origin being taken as the fixed point.

21. Change the order of integration in

$$\int\limits_{0}^{\infty}\int\limits_{x}^{\infty}\dfrac{e^{-y}}{y}\,dxdy$$ and hence find its value.

22. Solve by Cramer's rule :

$3y + 4z = 14.8$

$4x + 2y - z = -6.3$

$x - y + 5z = 13.5.$

23. Find the eigen vectors of $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$.

$(2\times5=10)$