



M 8870



Reg. No. :

Name :

II Semester B.Sc. Degree (CCSS – 2014 Admn. – Regular)
Examination, May 2015
COMPLEMENTARY COURSE IN MATHEMATICS
2C02 MAT-PH : Mathematics for Physics and Electronics – II

Time : 3 Hours

Max. Marks : 40

SECTION – A

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

1. The volume obtained by revolving about X-axis the arc of the curve $y = f(x)$, intercepted between the points whose abscissal are a, b is _____
2. Give an example of a 3×3 skew symmetril matrix.

3. Find the rank of the matrix $\begin{bmatrix} 1 & -2 \\ 0 & 0 \\ -3 & 6 \end{bmatrix}$.

4. What is meant by the spectrum of a square matrix A ? (4x1=4)

SECTION – B

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

5. Evaluate $\int_0^1 x^2(1-x^2)^{3/2} dx$.
6. Find the area of the ellipse $x = a \cos t, y = b \sin t$.
7. Find the volume of the solid obtained by revolving one arc of the cycloid $x = a(\theta + \sin\theta), y = a(1 + \cos\theta)$.

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

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

10. Find a 2×2 matrix $A \neq 0$ such that $A^2 = 0$.

11. Prove that the determinant of an orthogonal matrix has the value $+1$ or -1 .

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

13. If $A = \begin{bmatrix} 1 & 3 \\ 2 & 6 \end{bmatrix}$, find A^2 using Cayley-Hamilton theorem. (7×2=14)

SECTION - C

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

14. If $I_n = \int_0^{\pi/3} \tan^n x \, dx$, show that $(n-1)(I_n + I_{n-2}) = (\sqrt{3})^{n-1}$.

15. Find the length of the arc of the parabola $x^2 = 4ay$ measured from the vertex to one extremity of the latus rectum.

16. Find the surface of the solid generated by the revolution of the lemniscate $r^2 = a^2 \cos 2\theta$ about the initial line.

17. Using Gauss elimination method, solve the linear system :

$$x_1 - x_2 + x_3 = 0$$

$$-x_1 + x_2 - x_3 = 0$$

$$10x_2 + 25x_3 = 90$$

$$20x_1 + 10x_2 = 80$$



18. Show by an example that $\text{rank } A = \text{rank } B$ does not imply $\text{rank } A^2 = \text{rank } B^2$.

19. Determine the eigen values and eigen vectors of the matrix $\begin{bmatrix} -5 & 2 \\ 2 & -2 \end{bmatrix}$. (4×3=12)

SECTION - D

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

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

21. Change the order of integration in $\int_0^a \int_0^x \frac{f'(y) \, dy \, dx}{\sqrt{(a-x)(x-y)}}$ and hence find its value.

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

23. Find an eigen basis and diagonalize : $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 3 & 2 \\ 0 & 0 & 2 \end{bmatrix}$. (2×5=10)