



K16U 1222



Reg. No. :

Name :

II Semester B.Sc. Degree (CCSS – Reg./Supple./Improv.)
Examination, May 2016
COMPLEMENTARY COURSE IN MATHEMATICS
2C02 MAT-PH : Mathematics for Physics and Electronics – II
(2014 Adm. Onwards)

Time : 3 Hours

Max. Marks : 40

SECTION – A

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

1. Evaluate $\int_0^{\pi/2} \sin 7x \, dx$.
2. Give an example of a 3x3 symmetric matrix.
3. Give an example of a 3x3 non zero singular matrix.
4. State the Cayley-Hamilton Theorem. (4x1=4)

SECTION – B

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

5. Evaluate $\int_0^{\infty} \frac{dx}{(1+x^2)^4}$.
6. Find the area of the cardioid $r = a(1 - \cos\theta)$.
7. Find the length of the arc of the curve $y = \log \sec x$ from $x = 0$ to $x = \frac{\pi}{3}$.

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

9. Evaluate $\int_1^2 \int_1^x \frac{x^2}{y^2} dy dx$.

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

11. Find the eigen values of the matrix $\begin{bmatrix} 5 & -2 \\ 9 & -6 \end{bmatrix}$.

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

13. Show that the eigen values of a diagonal matrix are the same as its diagonal elements. (7×2=14)

SECTION - C

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

14. Find the perimeter of the loop of the curve $9ay^2 = (x - 2a)(x - 5a)^2$.

15. 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.

16. Determine the inverse of the matrix $\begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$ by the Gauss-Jordan method.

17. 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.



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

$$4y + 4z = 24$$

$$3x - 11y - 2z = -6$$

$$6x - 17y + z = 18.$$

19. Find the defect of an eigen value of the matrix $\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$. (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 the cycloid $x = a(\theta + \sin\theta)$, $y = a(1 - \cos\theta)$, the fixed point being the origin.

21. Change the order of integration in $\int_0^{\infty} \int_x^{\infty} \frac{e^{-y}}{y} dx dy$ 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 an eigenbasis and diagonalize :

$$\begin{bmatrix} 3 & 10 & -15 \\ -18 & 39 & 9 \\ -24 & 40 & -15 \end{bmatrix}$$

(2×5=10)