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 $\int_{0}^{\pi/2} \sin 7_x \, dx$.

2. Give an example of a 3×3 symmetric matrix.

3. Give an example of a 3×3 non zero singular matrix.
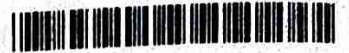
4. State the Cayley-Hamilton Theorem. **(4×1=4)**

SECTION – B

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

5. Evaluate $\int_{0}^{\infty} \dfrac{dx}{(1+x^2)^4}$.

6. Find the area of the cardioide $r = a\,(1 - \cos\theta)$.

7. Find the length of the arc of the curve $y = \log \sec x$ from $x = 0$ to $x = \pi/3$.

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

9. Evaluate $\displaystyle\int_{1}^{2}\int_{1}^{x} \dfrac{x^2}{y^2}\, dy\, dx$.

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.

$(7\times2=14)$

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 $\int\limits_0^\infty \int\limits_x^\infty \dfrac{e^{-y}}{y} \, dx \, dy$ 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)