



K18U 0502

Reg. No. : .....

Name : .....

**II Semester B.Sc. Degree (CBCSS – Reg./Supple./Improv.)**  
**Examination, May 2018**  
**COMPLEMENTARY COURSE IN MATHEMATICS**  
**2C02 MAT-PH : Mathematics for Physics and Electronics – 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. Evaluate  $\int_1^2 \int_0^{3y} y \, dy \, dx$ .

2. Evaluate  $\int_0^{\pi/2} \sin^5 x \, dx$ .

3. What is a scalar matrix ?

4. What is meant by the spectral radius of an  $n \times n$  matrix A ? **(1×4=4)**

**SECTION – B**

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

5. Obtain the reduction formula for  $\int \sin^n x \, dx$ .

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

7. 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.



8. If  $a = \begin{bmatrix} 5 \\ 1 \\ 2 \end{bmatrix}$  and  $b = [3 \ 0 \ 8]$ , calculate  $-(4b)(7a)$ .

9. Solve the following system :

$$3.0x + 6.2y = 0.2$$

$$2.1x + 8.5y = 4.3$$

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

11. Find the eigenvalues of the matrix,  $B = \begin{bmatrix} -5 & 2 \\ 2 & -2 \end{bmatrix}$ .

12. Find the condition on  $a$  and  $b$  such that the matrix  $\begin{bmatrix} a & b \\ -b & a \end{bmatrix}$  is  
i) symmetric and ii) orthogonal.

13. Is the matrix,  $\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$  diagonalizable? Justify. (2x7=14)

### SECTION - C

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

14. Evaluate  $\int_0^{\pi/4} (\cos 2\theta)^{3/2} \cos \theta \, d\theta$ .

15. Find the length of the curve  $y = \log \left\{ \frac{e^x - 1}{e^x + 1} \right\}$  from  $x = 1$  to  $x = 2$ .

16. Find the surface of the solid formed by revolving the cardioid  $r = a(1 + \cos \theta)$  about the initial line.

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



18. Find the rank and a basis for the row space and for the column space of the

matrix,  $\begin{bmatrix} 8 & 2 & 5 \\ 16 & 6 & 29 \\ 4 & 0 & -7 \end{bmatrix}$ .

19. Find an eigenbasis for the matrix  $A = \begin{bmatrix} 5 & 3 \\ 3 & 5 \end{bmatrix}$ . (3x4=12)

### SECTION - D

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

20. Evaluate  $\int_0^a (a^2 + x^2)^{5/2} \, dx$ .

21. If the hyperbola  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$  revolves about the  $x$ -axis, show that the volume included between the surface thus generated, the cone generated by the asymptote and two planes perpendicular to the axis, of  $x$ , at a distance  $h$  apart, is equal to that of a circular cylinder of height  $h$  and radius  $b$ .

22. Solve :  $w + 2x - 3z = 30$

$$4x - 5y + 2z = 13$$

$$2w + 8x - 4y + z = 42$$

$$3w + y - 5z = 35$$

23. Given  $A = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 1 & 1 \\ 2 & 3 & 1 \end{bmatrix}$ , use the fact that  $A$  satisfies its characteristic equation to

compute  $A^3$  and  $A^4$ ; also, since  $A$  is non-singular, to compute  $A^{-1}$  and  $A^{-2}$ . (5x2=10)