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 × 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 cardioide $r = a(1 - \cos\theta)$.

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. **(2×7=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 $y = \log \{(e^x - 1) / (e^x + 1)\}$ from $x = 1$ to $x = 2$.

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

17. Evaluate $\int\int xy(x + y)dx\,dy$ 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 $A = \begin{bmatrix} 5 & 3 \\ 3 & 5 \end{bmatrix}$. **(3×4=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}. **(5×2=10)**
