II Semester B.Sc. Degree (CBCSS – Supplementary/Improvement) Examination, April 2020
COMPLEMENTARY COURSE IN MATHEMATICS
2C02 MAT – PH : Mathematics for Physics and Electronics – II
(2014 – 2018 Admissions)

Time : 3 Hours

Max. Marks : 40

SECTION – A

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

1. What is the area bounded by the curve $y = f(x)$ between $x = a$ and $x = b$?

2. The volume obtained on revolving about y-axis the arc of the curve $x = 1$ intercepted between the points whose ordinates are a, b is given by _____

3. Write the transpose of the matrix $A = \begin{pmatrix} 1 & 5 & 4 \\ 3 & 6 & 7 \end{pmatrix}$.

4. What is the rank of the matrix $B = \begin{pmatrix} 2 & 5 \\ -4 & 10 \end{pmatrix}$?

SECTION – B

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

5. Evaluate $\sin^4 x\, dx$.

6. Find the area bounded by $xy^2 = a^2 (a - x)$ and the y-axis.

7. Find the length of the arc of the equiangular spiral $r = a^{\theta \cot \alpha}$ between the points for which the radii vectors are r_1 and r_2.

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 x-axis.

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

10. Evaluate $\int_0^4 \int_0^{2\sqrt{z}} \int_0^{\sqrt{4z-x^2}} dz \, dx \, dy$.

11. Give example to show that for two square matrices A and B, AB need not be equal to BA.

12. Are the vectors (−1, 2) and (1/2, −1) linearly independent ? Why ?

13. If $A = \begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$, show that 2 is an eigen value of A by giving an eigen vector.

SECTION – C

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

14. Evaluate $\int \sin^3 x \cos^2 x \, dx$.

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

16. Solve the system of equations by Gaussian Elimination :
    x + 2y = 3
    4x + y = 4.

17. Find rank of the matrix $\begin{pmatrix} 1 & 1 & 2 \\ 0 & -2 & -4 \\ 3 & 2 & 1 \end{pmatrix}$ by row operations.

18. Find the characteristic equation and hence the eigen values of the matrix $\begin{pmatrix} 1 & 2 \\ 1 & 1 \end{pmatrix}$.

19. Using the fact $A = \begin{pmatrix} 1 & 2 \\ 0 & 3 \end{pmatrix}$ satisfies its characteristic equation, find A^2.

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. Show that $\int_0^1 \left[\int_0^1 \frac{x-y}{(x+y)^2} dy \right] dx \neq \int_0^1 \left[\int_0^1 \frac{x-y}{(x+y)^2} dx \right] dy$.

22. Solve the system of linear equations.
    $x + y + z = 6$
    $x + 2y + 3z = 10$
    $x + 2y + 6z = 5$
    by row reducing it.

23. Find eigen values and corresponding eigen vectors for the matrix
    $A = \begin{pmatrix} 1 & 4 \\ 2 & 3 \end{pmatrix}$.