

K20U 0311

Reg. No. : .....

Name : .....

**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  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  about the x-axis.

P.T.O.





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

$$A = \begin{pmatrix} 1 & 4 \\ 2 & 3 \end{pmatrix}.$$

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