



Reg. No. : .....

Name : .....

**III Semester B.Sc. Degree (CBCSS – Sup./Imp.)**

**Examination, November 2021**

**(2015-'18 Admissions)**

**COMPLEMENTARY COURSE IN MATHEMATICS**

**3C03MAT – PH : Mathematics for Physics and Electronics – III**

Time : 3 Hours

Max. Marks : 40

**SECTION – A**

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

1. Verify that  $y = \sec x$  is a solution of  $y' = y \tan x$ .
2. Check the linear independence of  $e^{2x}$  and  $xe^{2x}$ .
3. Define unit step function  $U(t - a)$ .
4. Examine whether  $f(x) = \sin x + \cos x$  is odd, even or neither odd nor even.

**SECTION – B**

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

5. Find the integrating factor of  $(x^2 - 2x + 2y^2)dx + 2xydy = 0$ .
6. Solve  $y' = 1 + y^2$ .
7. Represent the family of all circles through the origin and tangent to the y-axis in the form  $f(x, y, c) = 0$ .
8. Solve  $y'' + 4y' + 4y = 0$ .
9. Using the definition, find the Laplace transform of  $2t + 3$ .





10. Find the inverse Laplace transform of  $\frac{1}{s(2s+1)}$ .
11. Find  $a_n$  of the Fourier series of  $f(x) = x + x^2$ ,  $-\pi < x < \pi$ .
12. Examine whether  $f(x) = \sin x + \cos x$  is odd, even or neither odd nor even.
13. Verify that  $u = e^x \cos y$  is a solution of the two dimensional Laplace equation  $u_{xx} + u_{yy} = 0$ .

## SECTION – C

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

14. Solve the initial value problem  $y' = -2xy; y(0) = 1$ .
15. Solve  $y'' + 4y' - 5y = 0$ ,  $y(0) = 1$ ,  $y'(0) = 1$ .
16. Solve  $(D^2 - 2D + 1)y = e^x$ .
17. Using convolution, find the inverse Laplace transform of  $\frac{1}{(s^2 + 1)^2}$ .
18. Find a solution  $u(x, y)$  of the equation  $u_x + u_y = (x + y)u$  by separating variables.
19. Find the Fourier Cosine series of  $f(x) = \pi - x$ ,  $0 < x < \pi$ .

## SECTION – D

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

20. Show that the equation  $(3x^2y + e^y)dx + (x^3 + xe^y - 2y)dy$  is exact and solve it.
21. Find the second order homogeneous linear differential equation for which  $x^3$  and  $x^3 \ln x$  are solutions.
22. Solve using Laplace transform  $y'' - 3y' + 2y = 4e^{2t}$ ,  $y(0) = -3$ ,  $y'(0) = 5$ .
23. Find the two half range expansions of  $f(x) = x$ ,  $0 < x < 2$ .
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