



K23U 3741

Reg. No. :

Name :

III Semester B.Sc. Degree (CBCSS – Supplementary)
Examination, November 2023
(2017 – 2018 Admissions)
COMPLEMENTARY COURSE IN MATHEMATICS
3C03MAT – CS : Mathematics for Computer Science – III

Time : 3 Hours

Max. Marks : 40

SECTION – A

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

1. Verify that $y = ce^{-x} + x^2 - 2x$ is a solution of the differential equation $y' + y = x^2 - 2$.
2. Show that $\cos \pi x$ and $\sin \pi x$ are linearly independent.
3. State the Linearity property of the Laplace transform.
4. Write the one dimensional Heat equation.

SECTION – B

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

5. Solve the initial value problem $y^3 \frac{dy}{dx} + x^3 = 0, y(0) = 1$.
6. Solve the initial value problem $\frac{dy}{dx} + y \tan x = \sin 2x, y(0) = 1$.
7. Find an ordinary differential equation for which $1, e^{-3x}$ are solutions.
8. Find a general solution of the differential equation $4y'' - 20y' + 25y = 0$.
9. Solve $(D^2 + 6D + 13I)y = 0$.
10. Find the Laplace transform of t^a .
11. Find the Inverse Laplace transform of $\frac{1}{s^2(s^2 + w^2)}$

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12. Show that $\int_{-\pi}^{\pi} \cos mx \cos nx \, dx = 0$, where m and n are integers, $m \neq n$.
13. Show that the functions $u = 4x^2 + t^2$ and $u = \sin 8x \cos 2t$ are solutions of the wave equation $u_{tt} = c^2 u_{xx}$ for appropriate value of c .

SECTION - C

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

14. Show that the differential equation $2\sin 2x \sinh y \, dx - \cos 2x \cosh y \, dy = 0$, $y(0) = 1$ is exact and solve it.
15. Solve the differential equation $2xyy' = y^2 - x^2$.
16. Reduce to first order and solve the differential equation $y'' + y'^3 \sin y = 0$.
17. Find the inverse Laplace transform of $\frac{1}{s^4 + \pi^2 s^2}$.
18. Find the Fourier series of the function $f(x) = x^2$, $0 < x < 2\pi$.
19. Transform into normal form and solve the PDE $x u_{xy} - y u_{yy} = 0$.

SECTION - D

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

20. Find the orthogonal trajectory of the curve $y = ce^{-3x}$.
21. Solve the initial value problem $y'' + 2y' + 10y = 17\sin x - 37\sin 3x$, $y(0) = 6.6$, $y'(0) = -2.2$.
22. Using Convolution theorem solve the initial value problem $y'' + 5y' + 4y = 2e^{-2t}$, $y(0) = 0$, $y'(0) = 0$.
23. Solve the one dimensional Heat equation $u_t = c^2 u_{xx}$ having boundary equations $u(0,t) = u(L,t) = 0$ for all t and the initial condition $u(x,0) = f(x)$.