



K23U 3738

Reg. No. :

Name :

III Semester B.Sc. Degree (CBCSS – Supplementary)
Examination, November 2023
(2017 – 2018 Admissions)
COMPLEMENTARY COURSE IN MATHEMATICS
3C03 MAT – PH : Mathematics for Physics and Electronics – III

Time : 3 Hours

Max. Marks : 40

SECTION – A

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

1. A necessary condition that the equation $Mdx + Ndy = 0$ is exact is that _____.
2. The Laplace transform of e^{-t} is _____.
3. Is the function $f(x) = x|x|$ even, odd or neither.
4. What is the heat conduction equation.

SECTION – B

Answer any 7 out of the 9 questions. Each question carries 2 marks.

5. Solve $2xy \frac{dy}{dx} - y^2 + x^2 = 0$.
6. Show that the equation $xy' + y + 4 = 0$ is exact and solve it.
7. Solve $y' - y = 3e^x$.
8. Find the wronskian of e^{-2t} and t .
9. Solve the initial value problem $y'' + 5y' + 6y = 0$, $y(0) = 2$, $y'(0) = 3$.
10. Solve $x^2y'' + xy' + y = 0$.
11. Find the Laplace transform of $t \cos 4t$.
12. Find the inverse Laplace transform of $\frac{1}{(s-a)s^2}$.
13. Solve the partial differential equation $u_x + u_y = 0$.

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SECTION – C

Answer any 4 out of the 6 questions. Each question carries 3 marks.

14. Find the orthogonal trajectories of the family of curves $xy = c^2$.
15. Solve $x^2y'' - 5xy' + 9y = 0$, given that $y = x^3$ is a solution.
16. Find the inverse Laplace transform of $\frac{s}{(s-1)(s^2+4)}$.
17. Find the Fourier cosine series for the function $f(x) = x$, $0 < x < L$.
18. Show that $u = e^{nx+iny}$ and $u = e^{nx-iny}$ are both solutions of the Laplace equation.
19. Find the solution of the wave equation corresponding to the triangular initial deflection

$$f(x) = \begin{cases} \frac{2kx}{L}, & \text{if } 0 < x < \frac{L}{2} \\ \frac{2k(L-x)}{L}, & \text{if } \frac{L}{2} < x < L \end{cases} \text{ and the initial velocity zero.}$$

SECTION – D

Answer any 2 out of the 4 questions. Each question carries 5 marks.

20. Solve $xy' + y = xy^3$.
21. Solve using the method of variation of parameters $y'' + y = \operatorname{cosec} x$.
22. Using Laplace transform solve the initial value problem $y'' - 2y' - 3y = \sin t$, given that $y(0) = y'(0) = 0$.
23. Let $f(x)$ be a function of period 2π such that $f(x) = x$, $-\pi < x < \pi$, find the Fourier series for $f(x)$. Also deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \dots$