

Reg. No. :

Name :

Third Semester B.Sc. Degree (CBCSS – Supplementary)
 Examination, November 2022
 (2016-18 Admissions)
COMPLEMENTARY COURSE IN MATHEMATICS
3C03MAT – CH : Mathematics for Chemistry – III

Max. Marks : 40

Time : 3 Hours

SECTION – A

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

1. Verify that $y = ce^{-x}$ is a solution of $y' + y = 0$.
2. Find the Laplace transform of e^{at+b} .
3. If $y_1 = \sin 3x$, $y_2 = \cos 3x$, find the Wronskian $w(y_1, y_2)$.
4. Examine whether $f(x) = x^2$ ($0 < x, 2\pi$) 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 $y' + \frac{y}{x} = x^3$.
6. Solve the initial value problem $(1-y)y' = 1 + xe^{x^2}$, $y(0) = 1$.
7. Solve $y'' = x^{-4}$.
8. Solve $x^2y'' + 7xy' + 13y = 0$.
9. Find the Laplace transform of $\sin^2 t$.
10. Find the Laplace transform of e^{at} , by using definition.
11. Find a solution of $u_{xx} = u_x$.

P.T.O.



12. Verify that $u = e^{2t} \cos x$ is a solution of the heat equation $u_t = -2u_{xx}$.
13. Find a_0 of the Fourier series of $f(x) = \begin{cases} 1 & \text{if } -\pi < x < 0 \\ -1 & \text{if } 0 < x < \pi \end{cases}$.

SECTION – C

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

14. Show that the equation $(1 + 4xy + 2y^2)dx + (1 + 4xy + 2x^2)dy = 0$ is exact and solve it.
15. Solve $y'' - y' - 2y = 6e^x$.
16. Find the general solution of $y'' - y = 2\cos x$, if $y_p = -\cos x$ is a particular solution.
17. Find the inverse Laplace transform of $\cot^{-1}\left(\frac{s}{2}\right)$.
18. Find a solution $u(x, y)$ of the equation $xu_{xy} + 2yu = 0$ by separating variables.
19. Find the Fourier series of $f(x) = x$, $-\pi < x < \pi$.

SECTION – D

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

20. Find the orthogonal trajectory of $x^2 + y^2 = c^2$.
21. Solve using Laplace transform $y'' + 2y' + 5y = e^{-t} \sin t$, $y(0) = 0$, $y'(0) = 1$.
22. Find a second order homogeneous linear differential equation for which x^2 and $x^2 \ln x$ are solutions.
23. Find the Fourier series of $f(x) = x + x^2$, $-\pi < x < \pi$.