K21U 1837

Reg. No. : .....

Name : .....

III Semester B.Sc. Degree CBCSS (OBE) Reg./Sup./Imp. Examination, November 2021
(2019-2020 Admission)
COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS
3C03 MAT-CS : Mathematics for Computer Science – III

Time : 3 Hours Max. Marks : 40

PART – A

Answer **any four** questions. **Each** question carries **one** mark.

1. Solve $y' = -2xy$, $y(0) = 3$.
2. Show that $\sin x \cos y dx + \cos x \sin y dy = 0$ is an exact differential equation.
3. Find the general solution of $y'' - 5y' + 6y = 0$.
4. Find the Wronskian of $\sin 2x$ and $\cos 2x$.
5. Give an example of an odd function in the interval $[-2, 2]$.

PART – B

Answer **any seven** questions. **Each** question carries **two** marks.

6. Solve $\frac{dy}{dx} = e^{x+2y} + xe^{2y}$, given that $y(0) = 0$.
7. Solve $y' + y \tan x = \sin 2x$.
8. Solve $x(x + y^2)dx + y(y + x^2)dy = 0$.
9. Solve $y'' - 2y' + 2y = 0$.
10. Solve $y'' - y' - 6y = e^{3x}$.
11. Find the inverse Laplace transform of $\frac{s+3}{s^2 - 4s + 13}$.

P.T.O.

12. Find the Laplace transform of $f(t) = \begin{cases} 0 & 0 < t < 1 \\ t-1 & 1 < t < 2 \\ 1 & t > 2 \end{cases}$.

13. Find the Fourier series expansion of $f(x) = x$ in the interval $-\pi \le x \le \pi$.

14. Find the Fourier sine series expansion of $f(x) = x^2$ in $(0, \pi)$.

15. Show that $u = e^{-t} \sin t$ satisfy the heat equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ for suitable c.

PART – C

Answer **any four** questions. **Each** question carries **three** marks.

16. Solve $y \log y\, dx + (x - \log y)\, dy = 0$.

17. Solve $2xy\, y' = x^2 - y^2$.

18. Solve $y'' + y = \sec x$.

19. Solve the Volterra integral equation.

$$y(t) - \int_0^t (1+\tau) y(t-\tau) d\tau = 1 - \sinh t$$

20. Solve $\frac{d^2y}{dt^2} - 2\frac{dy}{dt} + y = e^t$ using Laplace transforms, given that $y(0) = 2$ and $y'(0) = -1$.

21. Using the method of separation of variables solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$.

22. Find the Fourier series expansion of $f(x) = \frac{\pi - x}{2}$ in $0 \le x \le 2\pi$.

PART – D

Answer **any two** questions. **Each** question carries **five** marks.

23. Solve the following differential equations

a) $(1+y^2)dx = (\tan^{-1}y - x)\,dy$

b) $(y^2e^{xy^2} + 4x^3)\,dx + (2xye^{xy^2} - 3y^2) = 0.$

24. Solve the following differential equations

a) $x^2y'' + xy + y = 0$, $y(1) = 0$ and $y'(1) = \frac{5}{2}$.

b) $y'' - 6y' + 9y = e^{3x} + \cos 3x.$

25. a) Solve the system of ODE $y'_1 = 4y_1 + y_2$, $y'_2 = -y_1 + 2y_2$ given that $y_1(0) = 3$ and $y_2(0) = 1$.

b) Find the inverse Laplace transform of $\frac{\omega}{s^2(s^2+\omega^2)}$.

26. a) Find the Fourier series expansion of $f(x) = 2 - x$ for $-2 < x < 2$.

b) Find the Fourier cosine series of $f(x) = \begin{cases} x & \text{if } 0 \le x < 0.5 \\ 1-x & \text{if } 0.5 < x < 1 \end{cases}$.