



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  $\frac{s+3}{s^2 - 4s + 13}$ .

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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  $-\pi \leq x \leq \pi$ .
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  $2xyy' = x^2 - y^2$ .
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  $0 \leq x \leq 2\pi$ .



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

24. Solve the following differential equations

a)  $x^2 y'' + xy' + y = 0, y(1) = 0$  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  $f(x) = \begin{cases} x & \text{if } 0 \leq x < 0.5 \\ 1-x & \text{if } 0.5 < x < 1 \end{cases}.$

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