



K20U 1833

Reg. No. : .....

Name : .....

III Semester B.Sc. Degree CBCSS (OBE) – Regular  
Examination, November 2020  
(2019 Admission Only)

COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS  
3C03MAT-CH : Mathematics for Chemistry – III

Time : 3 Hours

Max. Marks : 40

Answer **any four** questions. **Each** question carries **1** mark.

1. Find a particular solution of the ODE  $y' + 5xy = 0$  when  $y(0) = \pi$ .
2. Find the Laplace transform of  $\cos^2 \omega t$ .
3. Define even and odd functions ? Is the function  $x^3 \sin nx$  even or odd ?
4. Verify that  $y = x^2$ ,  $y = 1$  are solutions of the non-linear ODE  $y''y - xy' = 0$  ?  
Is their sum is a solution ?
5. What is the Fourier series of a function and write the formula for finding the  
Fourier coefficients. (4×1=4)

Answer **any seven** questions. **Each** question carries **2** marks.

6. Solve the initial value problem  $y'' + y = 0$ ,  $y(0) = 3$ ,  $y'(0) = -0.5$ .
7. Solve  $xy' = 2y + x^3e^x$ .
8. Test whether  $\sin x \cos y dx + \cos x \sin y dy = 0$  is an exact differential equation.  
If exact solve it ?
9. Find the solution of  $y' + xy = xy^{-1}$  if  $y(0) = 3$ .
10. Solve  $(x^2D^2 - xD - 15I)y = 0$ .
11. Find the inverse Laplace transform of  $\frac{s+10}{s^2-s-2}$ .
12. Solve the initial value problem using Laplace Transforms  
 $y'' - 4y' + 3y = 0$ ,  $y(0) = 0$ ,  $y'(0) = 1$ .

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13. Find the Fourier series of the function  $f(x) = |x|$  in  $(-\pi, \pi)$ .

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

15. Solve  $y(t) - \int_0^t y(\tau) d\tau = 1$  by Laplace transform. (7×2=14)

Answer **any four** questions. **Each** question carries **3** marks.

16. Solve the differential equation  $y' = y + x$ ,  $y(0) = 0$ .

17. Find the integrating factor and solve the initial value problem  
 $(e^{x+y} + ye^y)dx + (xe^y - 1)dy = 0$ ,  $y(0) = -1$ .

18. By method of undetermined coefficients of parameters, solve  
 $y'' + 5y' + 4y = 10e^{-3x}$ .

19. Find a second order homogeneous ODE for which the functions  $\cos 5x$  and  $\sin 5x$  are solutions and then solve the differential equation after showing that the functions are linearly independent.

20. Solve the Volterra integral equation  $y(t) - \int_0^t y(\tau) \sin(t - \tau) d\tau = t$ .

21. Using Laplace Transforms solve  $y'' + 9y = \begin{cases} 8 \sin t & 0 < t < \pi \\ 0 & t > \pi \end{cases}$   $y(0) = 0, y'(0) = 4$ .

22. Find the Fourier expansion of  $f(x) = \begin{cases} 0 & \text{if } -2 < x < -1 \\ k & \text{if } -1 < x < 1 \\ 0 & \text{if } 1 < x < 2 \end{cases}$  (4×3=12)

Answer **any two** questions. **Each** question carries **5** marks.

23. Solve the following differential equations.

a)  $\frac{dy}{dx} + y \tan x = \cos^2 x$ .

b)  $(1 + 4xy + 2y^2)dx + (1 + 4xy + 2x^2)dy = 0$ .

24. Using method of variation of parameters solve  $y'' + 9y = \operatorname{cosec} x$ .

25. Using Laplace Transforms solve the system  $y_1'' = y_1 + 3y_2, y_2'' = 4y_1 - 4e^t$   
 $y_1(0) = 2, y_1'(0) = -3, y_2(0) = -1, y_2'(0) = 2$ .

26. Find the Fourier series expansion of  $f(x) = x^2, -1 < x < 1$ . (2×5=10)