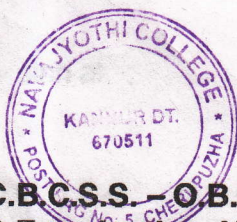




K23U 3437

Reg. No. : .....

Name : .....



III Semester B.Sc. Degree (C.B.C.S.S. – O.B.E. – Regular/Supplementary/  
Improvement) Examination, November 2023  
(2019 to 2022 Admissions)

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

Time : 3 Hours

Max. Marks : 40

PART – A

Answer any four questions. Each question carries 1 mark.

1. Give an example of second order initial value problem.
2. Solve  $y' + \sin x = 0$ .
3. Let  $y_1 = x^3$ ,  $y_2 = x^2$ . Find the Wronskian  $W(y_1, y_2)$ .
4. Find the Laplace transform of  $f(t) = \cos 2t$ .
5. Define even function. Give an example.

PART – B

Answer any seven questions. Each question carries 2 marks.

6. Solve  $y' = -2xy$ ,  $y(0) = 1$ .
7. Find the integrating factor of  $-y dx + x dy = 0$ .
8. Verify that the functions  $y_1 = e^{-x} \cos x$  and  $y_2 = e^{-x} \sin x$  are linearly independent.
9. Find the general solution of  $y'' - y' = 0$ .
10. Factor  $P(D) = D^2 - 3D - 40I$  and solve  $P(D)y = 0$ .

P.T.O.

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11. Find the Laplace transform of  $f(t) = \sinh at$ .

12. Find  $\mathcal{L}^{-1}\left[\frac{1}{(s-1)^4}\right]$ .

13. Find  $\mathcal{L}(te^{-t} \sin t)$ .

14. Let  $H(s) = \frac{1}{(s^2 + w^2)^2}$ . Find  $h(t)$ .

15. If  $f(x)$  and  $g(x)$  have period  $p$ , then show that  $h(x) = f(x) + g(x)$  also has period  $p$ .

PART - C

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

16. Show that the equation is  $2xy \, dx + x^2 \, dy = 0$  exact and solve it.

17. Solve the Bernoulli equation  $y' = y - y^2$ .

18. Solve the initial value problem  $y'' + y' - 2y = 0$ ,  $y(0) = 4$ ,  $y'(0) = -5$ .

19. Find  $\mathcal{L}(t^2 \cos t)$ .

20. Find the Laplace inverse of  $\frac{3s - 137}{s^2 + 2s + 401}$ .

21. Solve the initial value problem  $y'' - 3y' + 2y = 4t$ ,  $y(0) = 1$ ,  $y'(0) = -1$  using Laplace transform.

22. Show that if  $f$  and  $g$  are two even functions then  $f + g$  is also even function.

PART - D

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

23. Solve  $y' + y \tan x = \sin 2x$ ,  $y(0) = 1$ .

24. Solve  $y'' - 4y' + 4y = \frac{6e^{2x}}{x^4}$  by the method of variation of parameters.

25. Using Laplace transform, solve  $y'' - y' - 6y = 0$ ,  $y(0) = 11$ ,  $y'(0) = 28$ .

26. Find the Fourier series representation of the periodic function  $f(x) = |x|$  in  $[-\pi, \pi]$  with  $f(x + 2\pi) = f(x)$ . Also deduce that  $\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \dots$



**K22U 3638**

Reg. No. : .....

Name : .....

**Third Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/  
Improvement) Examination, November 2022  
(2019 Admission Onwards)  
COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS  
3C03 MAT-BCA : Mathematics for BCA III**

Time : 3 Hours

Max. Marks : 40

**PART – A**

**(Short Answer Questions)**

Answer **any four** questions from this Part. **Each** question carries **1** mark.

1. Verify that  $y = c/x$  where  $c$  is an arbitrary constant is a solution of ODE  $xy' = -y$  for  $x \neq 0$ .
2. Show that the ODE,  $y' = 1 + x^2$  is separable and hence find the solution.
3. Find the characteristic equation of the differential equation  $y'' - 2y = 0$ .
4. Let  $f(t) = e^t$ ,  $t \geq 0$ . Find  $F(s)$ .
5. Find the fundamental period of the function  $f(x) = \sin(10x)$ .

**PART – B**

**(Short Essay Questions)**

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

6. Show that the differential equation  $\cos(x + y)dx + (3y^2 + 2y + \cos(x + y))dy = 0$  is an exact differential equation.
7. Find an integrating factor of the ODE,  $-ydx + xdy = 0$ .
8. Solve  $y' = (4x + y)^2$ .
9. Give examples for each of the following :
  - a) Homogeneous Linear Ordinary Differential Equation.
  - b) Bernoulli Equation.

P.T.O.



10. Reduce the equation  $y' + y/x = y^2$  to a linear ODE.
11. Solve the differential equation  $y'' + y' + 0.25y = 0$ .
12. Find the Wronskian of the functions  $y_1 = \sin 2x$ ,  $y_2 = \cos 2x$ .
13. Find the Laplace transform of  $\cosh at$  and  $\sinh at$ .
14. Find the inverse Laplace transform of  $F(s) = \frac{1}{s^2 + 3s + 2}$ .
15. Find the Fourier coefficient  $a_0$  for the function  $f(x) = \begin{cases} -k, & -\pi < x < 0 \\ k, & 0 < x < \pi \end{cases}$  and  $f(x + 2\pi) = f(x)$ .

## PART - C

## (Essay Questions)

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

16. Solve  $y' = xy + x + y + 1$ .
17. Solve the Euler-Cauchy equation  $x^2y'' + 1.5xy' - 0.5y = 0$ .
18. Check whether the functions  $y_1 = e^x \sin x$  and  $y_2 = e^{-x} \sin x$  are linearly independent or not in the interval  $(0, \pi)$ .
19. Using Laplace Transform of the Derivative formula, find the Laplace Transform of  $f''(t)$ , where  $f(t) = t \sin \omega t$  and  $f'(0) = 0$ .
20. Let  $H(s) = \frac{1}{(s^2 + \omega^2)^2}$ . Find  $h(t)$ .
21. Write the Fourier coefficients  $a_0$ ,  $a_n$ ,  $b_n$  for the function  $f(x)$  of period  $p = 2L$ .
22. Find the Fourier series of the function  $f(x) = x$  with  $f(x + 2\pi) = f(x)$ .



PART - D

(Long Essay Questions)

Answer any two questions. Each question carries 5 marks.

23. Find an integrating factor and solve the initial value problem

$$(e^{x+y} + ye^y) dx + (xe^y - 1) dy = 0, y(0) = -1.$$

24. Solve the initial value problem  $y'' + 0.4y' + 9.04y = 0, y(0) = 0, y'(0) = 3.$

25. Find the inverse transform of  $\ln \frac{s^2 + \omega^2}{s^2}.$

26. Find the Fourier series of the function  $f(x) = \begin{cases} 0, & -2 < x < -1 \\ k, & -1 < x < 1 \\ 0, & 1 < x < 2 \end{cases}.$

SECTION - B

Write short notes on any six of the following questions.

(6x2=12)

- 1. Explain the types of casting in Java with example.
- 2. Explain the contexts where the keyword final is used.
- 3. Write a short note on applet life cycle.
- 4. Differentiate between method overloading and method overriding.
- 5. Explain the decision-making statements in Java with syntax and example.

Reg. No. : .....

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**III Semester B.Sc. Degree CBCSS (OBE) – Regular Examination, November 2020  
(2019 Admission Only)  
Complementary Elective Course in Mathematics  
3C03 MAT-BCA : Mathematics for BCA III**

Time : 3 Hours

Max. Marks : 40

## PART – A

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

1. Is  $(2 + 3x^2y^2) dx + 2x^3y dy = 0$  exact ?
2. Write characteristic equation of  $y''' + 3y' - 4y = 0$ .
3. Write the Laplace transform of  $t^2$ .
4. Write the fundamental period of  $\cos \pi x$ .
5. What is the Fourier series of an odd function  $f(x)$  defined on  $[-L, L]$  ? **(4×1=4)**

## PART – B

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

6. Solve the initial value problem  $y' = -2xy$ ,  $y(0) = 2.3$ .
7. Verify that  $y = e^{-x}$  is a solution of  $y'' = y$ .
8. Solve  $y' + y \tan x = \sin 2x$ .
9. Solve the initial value problem  $y' + y = y^2$ ,  $y(0) = \frac{-1}{3}$ .
10. Find general solution to  $y'' + 9y' + 20y = 0$ .
11. Find Wronskian of  $e^x$  and  $xe^x$ .
12. Find the inverse Laplace transform of  $\frac{1}{(s-a)s}$  using convolution.



13. Solve the Volterra integral equation of the second kind

$$y(t) - \int_0^t y(\tau) \sin(t - \tau) d\tau = t.$$

14. Find the Fourier series of the function  $f(x) = x + \pi$  if  $-\pi < x < \pi$  and  $f(x + 2\pi) = f(x)$ .

15. Find Fourier series for the following function.

$$f(x) = \begin{cases} 0 & \text{if } -2 < x < -1 \\ k & \text{if } -1 < x < 1 \\ 0 & \text{if } 1 < x < 2 \end{cases}$$

(7×2=14)

### PART - C

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

16. Solve  $\cos(x + y) dx + (y^2 + 2y + \cos(x + y)) dy = 0$ .

17. Solve the initial value problem  $(\cos y \sinh x + 1) dx - (\sin y \cosh x) dy = 0$ ,  $y(1) = 2$ .

18. Solve  $y'' + 2y' + y = 2 \sin x$ .

19. Solve  $x^2 y'' + xy' + 9y = 0$ .

20. Solve the initial value problem  $y'' - y = t$ ,  $y(0) = 1$  and  $y'(0) = 1$  using Laplace transform.

21. Find Laplace transform of  $f(t) = \sin 2t + 2t \cos 2t$ .

22. Find the Fourier series of

$$f(t) = \begin{cases} 0 & \text{if } -\frac{\pi}{\omega} < t < 0 \\ E \sin \omega t & \text{if } 0 < t < \frac{\pi}{\omega} \end{cases}$$

(4×3=12)



PART – D

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

23. Solve  $2xyy' = y^2 - x^2$ .

24. Solve :

a)  $y'' + 4y' + 4y = e^{-x} \cos x$ .

b)  $y'' + 5y' + 6y = e^{-3x}$ .

25. Find the inverse Laplace transform of

a)  $\frac{3s - 137}{s^2 + 2s + 401}$

b)  $\ln\left(1 + \frac{\omega^2}{s^2}\right)$

26. Find the Fourier series of

$$f(x) = \begin{cases} -k & \text{if } -\pi < x < 0 \\ k & \text{if } 0 < x < \pi \end{cases}$$

Also show that  $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots = \frac{\pi}{4}$

(2×5=10)



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Name : .....

**III Semester B.Sc. Degree CBCSS (OBE) Reg./Sup./Imp. Examination,  
November 2021  
(2019-2020 Admission)**

**Complementary Elective Course in Mathematics  
3C03 MAT-BCA : MATHEMATICS FOR BCA – III**

Time : 3 Hours

Max. Marks : 40

## PART – A

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

1. Is  $y = -\frac{C}{x}$  (c an arbitrary constant) is a solution of the ODE  $xy' = y$  for all  $x \neq 0$  ?
2. Write characteristic roots of  $y'' + 3y' + 2y = 0$ .
3. Write the Laplace transform of  $te^{-2t}$ .
4. Find  $a_0$  for the Fourier series of  $f(x) = x^3$  defined on  $[-1, 1]$ .
5. What is the Euler formula for calculating  $b_n$  of Fourier series of function  $f(x)$  defined on  $[-\pi, \pi]$  ?

## PART – B

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

6. Solve  $xy' = -y$ .
7. Check whether the equation  $\cos(x+y)dx + (y^2 + 2y + \cos(x+y))dy = 0$  exact or not ?
8. Solve  $y' + y \tan x = \sin 2x$ ,  $y(0) = 1$ .
9. Solve  $y' = Ay + By^2$ .



10. Find general solution to  $y'' + y = 0$ .

11. Solve  $y'' + 4y' + 4y = 2e^{-t}$ .

12. Find the Laplace transform of unit step function  $u(t-a) = \begin{cases} 0 & \text{if } t < a \\ 1 & \text{if } t > a \end{cases}$ .

13. Find the inverse Laplace transform of  $\frac{3s-10}{s^2+2s+40}$ .

14. Find the Fourier series of the function  $f(x) = x^2$  if  $-\pi < x < \pi$  and  $f(x+2\pi) = f(x)$ .

15. Find Fourier series for the following function

$$f(x) = |x|, -\pi < x < \pi$$

### PART - C

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

16. Solve  $(2 + 3x^2y^2)dx + 2x^3ydy = 0$ .

17. Solve  $(x^2 + y^2)dx - 2xydy = 0$ .

18. Solve  $y'' - y' - 6y = e^{3t} + 5$ .

19. Solve  $x^2y'' + xy' - y = 16x^3$ .

20. Solve the initial value problem  $y'' + 6y' + 8y = 0$ ,  $y(0) = 1$  and  $y'(0) = 1$  using Laplace transform.

21. Find the Fourier series of

$$f(t) = \begin{cases} 0 & \text{if } -\frac{\pi}{\omega} < t < 0 \\ E \sin \omega t & \text{if } 0 < t < \frac{\pi}{\omega} \end{cases}$$

22. Find Laplace transform of  $f(t) = \cos 2t + \sin 2t$ .



PART – D

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

23. Find the general solution to the initial value problem.

$$(e^{(x+y)} + ye^y)dx + (xe^y - 1)dy = 0; y(0) = -1.$$

24. Solve :

a)  $y'' + 4y' + 4y = e^{-x} \cos x.$

b)  $y'' + 5y' + 6y = e^{-3x}.$

25. Write the following function using unit step functions and find its Laplace transform.

$$f(t) = \begin{cases} 2 & \text{if } 0 < t < 1 \\ \frac{1}{2}t^2 & \text{if } 1 < t < \frac{\pi}{2} \\ \cos t & \text{if } t > \frac{\pi}{2} \end{cases}$$

26. Find the Fourier series of

$$f(x) = \begin{cases} x & \text{if } -\pi < x < 0 \\ \pi - x & \text{if } 0 < x < \pi \end{cases}$$

PART – B

Answer any seven questions. Each question carries two marks.

6. Solve  $xy' = -y.$

7. Check whether the equation  $\cos(x+y)dx + (y^2 + 2y + \cos(x+y))dy = 0$  exact or not?

8. Solve  $y' + y \tan x = \sin 2x, y(0) = 1.$

9. Solve  $y' = Ay + By^2.$