

2020

UNIVERSITY OF KERALA

DEPARTMENT OF MATHEMATICS

TRIPUNITHURUR

2020

2020



K20U 1834

Reg. No. :

Name :

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

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

Time : 3 Hours

Max. Marks : 40

Answer any four questions. Each question carries 1 mark :

- 1. Solve tanx.sin^2 ydx + cosx coty dy = 0.
2. Define Wronskian and find the Wronskian of e^x and xe^x.
3. Find the Laplace transform of e^-t sinh 4t.
4. Find the inverse Laplace transform of (2s+6)/(s^2+6s+10)^2.
5. Define even and odd functions with examples. (4x1=4)

Answer any seven questions. Each question carries 2 marks :

- 6. Solve (x + 2y^3) dy/dx = y.
7. Solve x dy/dx + y = x^2 y^2 log x.
8. Solve dy/dx + y tan x = cos x.
9. Solve y'' - 2y' - 3y = 2e^4x.
10. Solve d^2y/dx^2 + 3 dy/dx + 2y = x^3 + x^2.

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11. Find the inverse Laplace transform of $\frac{s+10}{s^2-s-2}$.
12. Find the Laplace transform of $(\sin \omega t) * (\cos \omega t)$.
13. Solve $y'' + 4y' + 5y = 50t, y(0) = 5, y'(0) = -5$.
14. Find the Fourier sine series for $f(x) = \cos x (0 < x < \pi)$.
15. Find the Fourier series for $|x|$ in $[-\pi, \pi]$. (7x2=14)

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

16. Find an integrating factor and solve the initial value problem
 $(e^{xy} + ye^y) dx + (xe^y - 1) dy = 0, y(0) = -1$.
17. Solve $\frac{dy}{dx} + \frac{2xy}{1+x^2} = \frac{1}{2x(1+x^2)}$.
18. Solve $y'' - y = e^x \sin 2x$.
19. Solve $(x^2 D^2 + xD - 1)y = 16x^3, y(1) = -1, y'(1) = 1$.
20. Solve the Volterra integral equation
 $y(t) = \int_0^1 y(\tau) \sin(t-\tau) d\tau = t$.
21. Solve $y_1' + y_2 = 0, y_1 + y_2' = 2 \cos t, y_1(0) = 1$ and $y_2(0) = 0$.
22. Find the Fourier expansion of $e^x (-\pi < x < \pi)$. (4x3=12)

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

23. Solve the following differential equations :
- a) $\frac{dy}{dx} - y \tan x = \frac{\sin x \cos^2 x}{y^2}$.
- b) $(e^y + 1) \cos x dx + e^y \sin x dy = 0$.
24. Using method of variation of parameters solve $\frac{d^2y}{dx^2} - y = \frac{1}{\cosh 2x}$.



25. Write the following function using unit step functions and find its 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 expansion of $f(x) = x^2, -1 < x < 1$. (2x5=10)