K20U 1836

Reg. No. : MG19CCSR17

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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-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 $y' = 1 + y^2$.
2. Find an integrating factor of the equation $\frac{dy}{dx} + y \tan x = \cos x$.
3. Find the Wronskian of x and xe^x.
4. Find a particular solution of $y'' + y = 0$.
5. Find the Fourier series expansion of $f(x) = \sin^2 x$ in the interval $[-\pi, \pi]$. **(4×1=4)**

PART – B

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

6. Solve $x\sqrt{1+y^2}dx + y\sqrt{1+x^2}dy = 0$, given that $y(0) = 0$.
7. Find the general solution of $xy' = 2y + x^3e^x$.
8. Solve $e^{x^2}(2xydx + dy) = 0$.
9. Solve $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = 0$.
10. Solve $y'' + y' - 12y = e^{2x}$.
11. Find the Laplace transform of $\cos^2 \omega t$.

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

13. Show that $u = e^x \cos y$ satisfy the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$.

14. Find the Fourier coefficients of $f(x) = \begin{cases} -k & \text{if } -\pi \le x < 0 \\ k & \text{if } 0 \le x \le \pi \end{cases}$ of period 2π.

15. Find the Fourier series expansion of $f(x) = x$ in $[-\pi, \pi]$.

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PART – C

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

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

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

18. Solve $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = \log x$.

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

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

21. Find the Fourier series expansion of $f(x) = \begin{cases} 0 & \text{if } -\pi < x < 0 \\ 1 & \text{if } 0 < x < \pi \end{cases}$ of period 2π.

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

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

24. Solve the following differential equations.

    a) $y'' - 4y' + 5y = e^{2x} \operatorname{cosec} x$.

    b) $y'' - 4y' + 4y = e^{2x}$.

25. a) Find the inverse Laplace transform of $\frac{1}{s^2(s^2+\omega^2)}$.

    b) Solve the system of differential equations $y_1' + y_2 = 0$, $y_1 + y_2' = 2\cos t$, $y_1(0) = 1$ and $y_2(0) = 0$.

26. Find the Fourier series expansion of $f(t) = \begin{cases} 0 & \text{if } -L < t < 0 \\ E \sin \omega t & \text{if } 0 < t < L \end{cases}$,

    where $L = \frac{\pi}{\omega}$.

(2×5=10)
