Q. P. Code: 20CSE363 HALL TICKET NO.: \_\_\_\_\_\_\_\_\_\_\_

B.TECH VI SEMESTER (R20)

REGULAR / SUPPLEMENTARY EXAMINATIONS - JUN - 2024

DIFFERENTIAL EQUATIONS AND TRANSFORMATIONTECHNIQUES

(Common to CSE, CSM, CAI and CSD)

Time: 3 Hours Max. Marks: 70

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## PART – A

Answer ALL questions. Each question carries 2 marks.

## B. Tech VI Semester (CO: R20 Computer Networks Examination, BT: -)

\*\*Time:\*\* 3 Hours \*\*Max Marks:\*\* 70. (CO: -, BT: -)

\*\*Part A. (CO: 10 x 2 = 20 Marks\*\*, BT: -)

\*\*. (CO: Answer all questions. Each question carries 2 marks.\*\*, BT: -)

1. Solve the differential equation $\frac{dy}{dx} + y \tan x = \sec x$. (CO: CO1, BT: BT1)

2. What is the order and degree of the differential equation $\frac{d^2y}{dx^2} + 3\left (CO: \frac{dy}{dx}\right^2 + 2y = 0$?, BT: -)

3. Form the partial differential equation by eliminating the arbitrary function from $z = f (CO: x^2 + y^2$., BT: -)

4. State the Lagrange's method for solving first order partial differential equations. (CO: CO2, BT: BT1)

5. Find the Laplace transform of $e^{-at} \sin (CO: bt$., BT: -)

6. State the initial value theorem for Laplace transforms. (CO: CO3, BT: BT1)

7. Determine the Fourier series of an odd function. (CO: CO4, BT: BT1)

8. What are Dirichlet's conditions for the existence of a Fourier series? (CO: CO4, BT: BT1)

9. State the convolution theorem for Laplace transforms. (CO: CO3, BT: BT1)

10. Define the Fourier transform of a function f (CO: x., BT: -)

\*\*Part B. (CO: 5 x 10 = 50 Marks\*\*, BT: -)

\*\*. (CO: Answer any five questions. Each question carries 10 marks.\*\*, BT: -)

\*\*Unit 1:\*\*. (CO: -, BT: -)

11. a) Solve the differential equation $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = e^{2x}$. (CO: CO1, BT: BT3)

b) A circuit consists of a resistance R and an inductance L connected in series with a constant electromotive force E. Set up the differential equation for the current i at time t and solve it. (CO: CO1, BT: BT3)

12. a) Solve $\frac{dy}{dx} + y \tan x = x^2 \sec x$, using an appropriate method. (CO: CO1, BT: BT3)

b) Solve: $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 5y = x^2\sin. (CO: \ln x$, BT: -)

\*\*Unit 2:\*\*. (CO: -, BT: -)

13. a) Solve the partial differential equation $px + qy = z$. (CO: CO2, BT: BT3)

b) Solve $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \sin. (CO: x+2y$ by the method of separation of variables., BT: -)

14. a) Find the solution of the partial differential equation $x^2 p + y^2 q = z (CO: x+y$., BT: -)

b) Form the partial differential equation by eliminating the arbitrary constants a and b from $z =. (CO: x+a, BT: -)

\*\*Unit 3:\*\*. (CO: -, BT: -)

15. a) Find the Laplace transform of the function $f (CO: t = t^2 e^{-3t} \cos 2t$., BT: -)

b) Using Laplace transforms, solve the differential equation: $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$, given that $y. (CO: 0 = 0$ and $y', BT: -)

16. a) State and prove the first shifting theorem of Laplace transforms. (CO: CO3, BT: BT2)

b) Use Laplace transforms to solve: $\frac{d^2y}{dt^2} + y = \sin. (CO: 2t$, BT: $y)

\*\*Unit 4:\*\*. (CO: -, BT: -)

17. a) Find the Fourier series of the function $f (CO: x = x^2$ in the interval $, BT: -)

b) Find the half-range cosine series for the function $f. (CO: x = x$ in the interval $, BT: -)

18. a) Find the Fourier series for the function f (CO: x defined by $f, BT: -)

b) Explain the concept of even and odd functions and their Fourier series representation. (CO: CO4, BT: BT2)

\*\*Unit 5:\*\*. (CO: -, BT: -)

19. a) Find the Fourier transform of $f (CO: x = e^{-ax^2}$, BT: where a > 0.)

b) State and prove the properties of Linearity and Scaling of Fourier Transforms. (CO: CO5, BT: BT2)

20. a) Find the Fourier sine transform of $f (CO: x = e^{-ax}$ for $x \ge 0$ where $a>0$., BT: -)

b) Explain the relationship between Fourier transforms, Fourier sine transforms and Fourier cosine transforms. (CO: CO5, BT: BT2)

\*\*Note:\*\* CO refers to Course Outcome, and BT refers to Bloom's Taxonomy level. (CO: BT1: Remembering, BT: BT2: Understanding)

## PART – B

Answer ONE question from each UNIT – Each question carries 10 marks.