

**PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(AUTONOMOUS)**

**I B.Tech I Semester Supplementary Examinations, July - 2024
DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS
(Common to All Branches)**

Time: 3 hours

Max. Marks: 70 M

**Answer ONE Question from each Unit
All Questions Carry Equal Marks**

Q. No.	Questions		BTL	CO	Marks
UNIT – I					
1.	a)	Solve the differential equation $(x^2 + 1)\frac{dy}{dx} + 2xy = x^2$.	K3	CO1	7M
	b)	If air is maintained at 20°C and the temperature of the body cools from 80°C to 60°C in 10 minutes, find the temperature of the body after 30 minutes.	K3	CO1	7M
OR					
2.	a)	Bacterial culture growing exponentially increases from 100 to 400 gm in 10 hours. How much bacteria was present after 3 hours?	K3	CO1	7M
	b)	Solve $y(1 + xy)dx + x(1 - xy)dy = 0$.	K3	CO1	7M
UNIT – II					
3.	a)	Solve the differential equation $(D^2 + 6D + 9)y = 5e^{3x}$	K3	CO2	7M
	b)	Solve the differential equation $(D^2 + 4)y = \sin 3x + \cos 2x$.	K3	CO2	7M
OR					
4.	a)	Solve $(D^4 - 1)y = \cos x$	K3	CO2	7M
	b)	Solve the differential equation $(D^2 + 1)y = x^2 e^{2x}$.	K3	CO2	7M
UNIT – III					
5.	a)	Find $\nabla^2 y_s$ using the following table: X: 1 2 3 4 5 Y: 2 5 10 17 26	K3	CO3	7M
	b)	Given $f(1) = 168$, $f(7) = 192$, $f(15) = 336$, use appropriate interpolation formula, find $f(10)$.	K3	CO3	7M
OR					
6.	a)	Find the missing entry in the following table: X: 0 1 2 3 4 Y: 1 3 9 ? 81	K3	CO3	7M
	b)	Find the value of $f(2.5)$ using Gauss forward interpolation formula given that $f(1) = 1$, $f(2) = 8$, $f(3) = 27$, $f(4) = 64$	K3	CO3	7M

UNIT – IV					
7.	a)	Find the third approximate root of the equation $x^3 - 9x + 1 = 0$ by bisection method.	K3	CO4	7M
	b)	Find a real root of the equation $\cos x = 3x - 1$ using iterative method. Correct up to three decimal places.	K3	CO4	7M
OR					
8.	a)	Find the real root of the equation $x \log_{10} x - 1.2 = 0$ by Regula – Falsi method. Perform the method up to finding second approximate root.	K3	CO4	7M
	b)	Using Newton – Raphson method, find the approximate root of the equation $x^3 - 6x + 4 = 0$ where x lies between 0 and 1.	K3	CO4	7M
UNIT – V					
9.	a)	Solve $\frac{dy}{dx} = x + y, y(1)=0$, numerically up to $x = 1.2$ with $h = 0.2$.	K3	CO5	7M
	b)	Use Runge – Kutta method, solve the differential equation $\frac{dy}{dx} = x + y, y(0)=1$, at $x = 0.1$.	K3	CO5	7M
OR					
10.	a)	Solve $\frac{dy}{dx} = 1 - y, y(0)=0$, using Euler's method up to $x = 0.2$ with $h = 0.1$.	K3	CO5	7M
	b)	Apply Taylor's series method to find the value of $y(1.1)$ given that $\frac{dy}{dx} = xy^{1/3}, y(1) = y'(1) = 0$,	K3	CO5	7M