ANURAG Engineering College
(An Autonomous Institution)
I B.Tech II Semester Supplementary Examinations, January – 2025
ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(COMMON TO ALL BRANCHES)

Time: 3 Hours **Max. Marks: 60**

Section – A (Short Answer type questions) (10 Marks)
Answer All Questions

		Course Outcome	B.T Level	Marks
1.	Find the integrating factor of $\left(3x^2y^4+2xy\right)dx+\left(2x^3y^3-x^2\right)dy=0$	CO1	L2	1M
2.	Find the orthogonal trajectories of $x^2+y^2=a^2$	CO1	L2	1M
3.	Find the complementary solution of $(D^2+2D+5)y=0$	CO2	L2	1M
4.	Find the particular solution of $(D^2+4)y=\sin 2x$	CO2	L2	1M
5.	Find $L\left[\sin 3t+t^4+e^{-2t}\right]$	CO3	L2	1M
6.	Evaluate $L^{-1}\left[\dfrac{1}{(s+2)(s-5)}\right]$	CO3	L2	1M
7.	Find the unit normal to the surface xyz^2 at the point $(1,0,3)$	CO4	L2	1M
8.	If $\overline{F}=x^2yz\overline{i}+xy^2z\overline{j}+xyz^2\overline{k},$ then find $div\overline{F}$ at $(1, 0, 0)$	CO4	L2	1M
9.	Evaluate $\displaystyle\int_{(0,0)}^{(2,4)} x^2dy$ along the curve $y=x^2$	CO5	L2	1M
10.	State Green's theorem	CO5	L1	1M

Section B (Essay Questions)
Answer all questions, each question carries equal marks. **(5 X 10M = 50M)**

			Course Outcome	B.T Level	Marks
11.	A)	Solve $\dfrac{dy}{dx}+2xy=2e^{-x^2}$	CO1	L3	10M
		OR			
	B)	A Copper ball is heated to temperature of 100^0C and is placed in water which is maintained at 30^0C. At the end of 3 minutes the temperature of ball is reduced to 70^0C. Find the time at which temperature of ball drops to 31^0C	CO1	L3	10M
12.	A)	Solve the differential equation $\left(D^3-3D^2+3D-1\right)y=x^2e^x$	CO2	L3	10M
		OR			
	B)	Solve the differential equation $\left(D^2+a^2\right)y=\tan ax$ by using method of variation of parameters	CO2	L3	10M
13.	A)	Find the $L\left[\displaystyle\int_0^t te^{-t}\sin 4t\,dt\right]$	CO3	L3	10M
		OR			
	B)	Using convolution theorem, find $L^{-1}\left(\dfrac{s^2}{(s^2+a^2)(s^2+b^2)}\right)$	CO3	L3	10M

14. A) Find the directional derivative of $f(x,y,z) = xy^2 + yz^3$ at $(2,-1,1)$ in the direction of $\bar{i} + 2\bar{j} + 2\bar{k}$.   CO4   L3   10M

OR

B) Show that $\vec{F} = (y^2 \cos x + z^3)\bar{i} + (2y \sin x - 4)\bar{j} + (3xz^2 - 2)\bar{k}$ is conservative field and find is scalar potential.   CO4   L3   10M

15. A) Find the work done in moving a particle in the force field $\vec{F} = 3x^2\bar{i} + \bar{j} + 2z\bar{k}$ along the straight line from $(0,0,0)$ to $(2,1,3)$ CO5   L3   10M

OR

B) Apply Stokes theorem for $\overline{F} = yi + zj + xk$ where S is the Upper half of the sphere $x^2 + y^2 + z^2 = 1$ bounded by projection of $xy-$plane.   CO5   L3   10M