Question Paper Code: R22A12HS01

R22

ANURAG Engineering College

(An Autonomous Institution)

I B.Tech II Semester Supplementary Examinations, Jan/Feb–2024

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.	State Newton's Law of cooling	CO1	L1	1M
2.	Find the integrating factor of $x^2ydx-(x^3+y^3)dy=0$	CO1	L2	1M
3.	Find $\frac{1}{D^2+4}\sin 2x$	CO2	L2	1M
4.	Find the complementary function of $\left(D^2+2D\right)y=0$	CO2	L2	1M
5.	Define unit step function	CO3	L1	1M
6.	Find $L\left\{e^{-t}\sin t\right\}$	CO3	L2	1M
7.	Find the gradient of $f=x^2+y^2z$	CO4	L1	1M
8.	If $\bar{F}=(x+3y)\bar{i}+(y-2z)\bar{j}+(x+pz)\bar{k}$ is solenoidal then find p.	CO4	L2	1M
9.	State Gauss Divergence theorem	CO5	L1	1M
10.	Define line integral	CO5	L1	1M

Section B (Essay Questions)

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

11. A)	The rate at which bacteria multiply is proportional to the instantaneous N numbers present. If the original number doubles in 2 hrs, When it will be tripled?	CO1	L3	10M
	OR			
B)	Solve $\frac{dy}{dx}-\frac{\tan y}{1+x}=(1+x)e^x\sec y$	CO1	L3	10M
12. A)	Solve $\left(D^3+2D^2+D\right)y=e^{2x}+\sin 2x$	CO2	L3	10M
	OR			
B)	Apply the method of variation of parameters to solve $\frac{d^2y}{dx^2}+y=\cos ecx$	CO2	L3	10M
13. A)	Find $L\left\{\int_0^t te^{-t}\sin 2t\,dt\right\}$	CO3	L3	10M
	OR			
B)	Using Convolution theorem, find $L^{-1}\left\{\frac{1}{s\left(s^2+4\right)}\right\}$	CO3	L3	10M
14. A)	Show that the vector $(x^2-yz)\bar{i}+(y^2-xz)\bar{j}+(z^2-xy)\bar{k}$ is irrotational and hence find its scalar potential.	CO4	L3	10M
	OR			

B)	Find the directional derivative of the function $f = x^2 - y^2 + 2z^2$ at the point P(1, 2, 3) in the direction of the line PQ where Q = (5, 0, 4)	CO4	L3	10M
15. A)	Use Gauss Divergence Theorem to evaluate $\iint_S \bar{F}.\bar{n}\, ds$ where S is the surface of the solid cut off by the plane x + y + z = a in the first octant.	CO5	L3	10M
	OR			
B)	Verify Green's theorem for $\int_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$ where C is the region bounded by $y = \sqrt{x}$ and $y = x^2$	CO5	L3	10M