Course Code: **23BS2T04**

BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE

(AUTONOMOUS)

I - B. TechII-Semester Supplementary Examinations (BR23), Sep/Oct - 2024

Differential Equations & Vector Calculus (All Branches)

Time: 3 hours | Max. Marks: 70

Question Paper consists of Part-A and Part-B

*Answer **ALL** the question in **Part-A andPart-B***

PART–A (10X2 = 20M)

		Marks	CO	BL
1. a)	Solve the differential equation $x\,dy - y\,dx = a(x^2 + y^2)dy$	(2M)	CO 1	L3
b)	State Newton's Law of Cooling.	(2M)	CO 1	L3
c)	Define Linear differential equations in y	(2M)	CO 2	L1
d)	Find Particular Integral of $(D^3 - 5D^2 + 8D - 4)y = e^{2x}$	(2M)	CO 2	L1
e)	Form the partial differential equation by eliminating the arbitrary constants from $2z = \sqrt{x+a} + \sqrt{y+b}$	(2M)	CO 3	L1
f)	Solve $[D^3 - 3D^2D' + (D')^3]z = 0$.	(2M)	CO 3	L3
g)	Define directional derivative of Scalar point function	(2M)	CO 4	L1
h)	Prove that$\bar{F} = yz\bar{\imath} + zx\bar{\jmath} + xy\bar{k}$is irrotational	(2M)	CO 4	L3
i)	State Gauss divergence theorem.	(2M)	CO 5	L4
j)	If $\bar{F} = 3xy\bar{\imath} - y^2\bar{\jmath}$evaluate $\int_c \bar{F}d\bar{r}$where C is the curve $y = 2x^2$in the xy-plane from (0,0) to (1,2)	(2M)	CO 5	L6

PART–B (5X10 = 50M)

		Marks	CO	BL
2.a)	(i) Solve the differential equation $(x^4 + y^4)dx - xy^3dy = 0$.	5(M)	CO 1	L3
	(ii) Solve the differential equation $(x+1)\frac{dy}{dx} - y = e^{3x}(x+1)^2$	5(M)	CO 1	L3
	(OR)			
b)	If the temperature of the body is changing from 100°c to 70°c in 15 minutes, find when the temperature will be 40°c, if the temperature of air is 30°c.	10(M)	CO 1	L3
3.a)	(i) Solve the differential equation $y^{11} - 4y^1 + 3y = 4e^{3x}$, given that y(0)=-1, $y^1(0)$=3	5 (M)	CO 2	L4
	(ii) Solve the differential equation $(D^2 - 2D + 1)y = x^2e^{3x} - Sin2x + 3$	5 (M)	CO 2	L4
	(OR)			
b)	Solve the differential equation$(D^2 + a^2)y = Secax$ using method of variation of	10(M)	CO 2	L4

parameters.

4.a)	(i) Form the partial differential equation by eliminating an arbitrary function from $z = xy + f(x^2 + y^2)$.	5 (M)	CO 3	L1
	(ii) Find Solution of $px^2 + qy^2 = z^2$.	5 (M)	CO 3	L3
	(OR)			
b)	Solve $\frac{\partial^2 z}{\partial x^2} - 6\frac{\partial^2 z}{\partial x \partial y} + 9\frac{\partial^2 z}{\partial y^2} = 12x^2 + 36xy$.	10(M)	CO 3	L3
5.a)	(i) Find the Directional derivative of a scalar point function $\varphi(x, y, z) = 4xy^2 + 2x^2yz$ at the point A(1,2,3) in the direction of the line AB, where B=(5,0,4)	5(M)	CO 4	L1
	(ii) Prove that $div(grad\, r^m) = m(m+1)r^{m-2}$	5(M)	CO 4	L4
	(OR)			
b)	Find constants a, b, c so that the vector A =(x+2y+az) i+(b x–3y–z)j+(4x+cy+2z)k is irrotational. Also find ϕ such that $A = \nabla\varphi$.	10(M)	CO 4	L1
6.a)	(i) If $\bar{F} = (5xy - 6x^2)\bar{\imath} + (2y - 4x)\bar{\jmath}, evaluate \int_C \bar{F} \cdot d\bar{r}$ along the curve C in the y-plane $y = x^3$ from (1, 1) to (2, 8).	5(M)	CO 5	L6
	(ii) Evaluate $\int_S \bar{f} \cdot \bar{n} ds$ where $\bar{f} = zi + xj - 3y^2zk$ and S is the surface $x^2 + y^2 = 16$ included in the first octant between z=0 and z=5.	5(M)	CO 5	L6
	(OR)			
b)	Verify Green's theorem for $\oint_C (3x^2 - 8y^2)dx + (4y - 6xy)dy$, where C is the boundary of the region bounded by $x = 0, y = 0$ and x+y=1	10(M)	CO 5	L3

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