DEPARTMENT OF MATHEMATICS

Course: NUMBER THEORY, VECTOR CALCULUS AND COMPUTATIONAL METHODS	IMPROVEMENT CIE	Maximum marks: 50
Course code: 22MA21C	Second semester 2022-2023 Physics Cycle Branch: AI, BT, CD, CS, CY, IS, SPARK-C	Time: 02:00PM-3:30PM Date: 06-09-2023

Sl. No.	Questions	M	BT	CO
1. (a)	A particle moves along the curve $x = t^3 + 1,\ y = t^2,\ z = 2t + 3$, where t is the time. Find the components of its velocity and acceleration at $t = 1$ in the direction $\hat{\imath} + \hat{\jmath} + 3\hat{k}$.	5	L1	1
1. (b)	If $\vec{f} = \nabla(2x^3y^2z^4)$, then find $div(\vec{f})$ at $(1,2,-1)$.	5	L2	2
2. (a)	Find the values of the constants a, b, c so that the directional derivative of $\phi = axy^2 + byz + cz^2x^3$ at $(1,2,-1)$ has maximum of magnitude 64 in a direction parallel to the z-axis.	6	L3	3
2. (b)	If $\vec{r} = x\hat{\imath} + y\hat{\jmath} + z\hat{k}$ and $r = \lvert\vec{r}\rvert$, then show that $\nabla r^n = nr^{n-2}\vec{r}$.	4	L3	3
3	Find the values of the constants a, b, c such that $\vec{F} = (x + 2y + az)\hat{\imath} + (bx - 3y - z)\hat{\jmath} + (4x + cy + 2z)\hat{k}$ is conservative. Also find its scalar potential.	10	L3	4
4	The following table gives the temperature θ of a cooling body at different instant of time t (in seconds) t: 1, 3, 5, 7, 9 θ: 85.3, 74.5, 67, 60.5, 54.3 Calculate θ at $t = 2$ and $t = 8$ using suitable interpolation formula. Also find approximate rate of cooling at $t = 9$ seconds.	10	L2	2
5. (a)	Using suitable interpolation formula find $y(11)$ for the following data x: 6, 7, 10, 12, 15 y: 3, 10, 43, 75, 138	6	L2	3
5. (b)	Given the following table of values of x and y, find by using inverse interpolation the value of x when $y = 100$. x: 1, 3, 5, 8 y: 10, 24, 54, 129	4	L2	3

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

Marks Distribution	Particulars	CO1	CO2	CO3	CO4	L1	L2	L3	L4	L5	L6
	Max Marks	5	15	20	10	05	25	20	--	--	--