DEPARTMENT OF MATHEMATICS

Course: NUMBER THEORY, VECTOR CALCULUS AND COMPUTATIONAL METHODS	CIE-II	Maximum marks: 50
Course code: 22MA21C	Second semester 2022-2023 Physics Cycle Branch: AI, BT, CD, CS, CY, IS, SPARK-C	Time: 10:00AM-11:30AM Date: 21-08-2023

Sl. No.	Questions	M	BT	CO
1	Using the method of variation of parameters, solve the differential equation $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = e^x \tan(x)$.	10	L3	3
2	Reduce the differential equation $x\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 4\frac{y}{x} = \log_e(x)$, where $x > 0$, to a linear differential equation with constant coefficients and hence solve.	10	L3	3
3. (a)	The current in an LRC circuit is governed by the differential equation $L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{c} = E(t)$. A circuit in series has an electromotive force given by $E(t) = 0V$, a resistor of 10Ω, an inductor of $0.25H$ and a capacitor of 0.001F. If the initial current and the initial charge on the capacitor are both zero, determine the charge on the capacitor at any time $t > 0$.	6	L2	2
3. (b)	Find all the solutions of the linear congruence $6x \equiv 15\ (mod\ 21)$.	4	L2	2
4. (a)	By using the Euclidean algorithm, determine the greatest common divisor d of 2947 and 3997 and find integers x and y to satisfy $2947x + 3997y = d$.	7	L1	1
4. (b)	Compute the last two digits of the number 87^{474}.	3	L2	2
5	Given the public key $(e, n) = (11,65)$, encrypt plain text J B E, where the alphabets $A, B, C, \ldots X, Y, Z$ are assigned the numbers $2,3,\cdots,26,27$. Give the cipher text. Find the private key d.	10	L3	4

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

Marks Distribution	Particulars	CO1	CO2	CO3	CO4	L1	L2	L3	L4	L5	L6
	Max Marks	7	13	20	10	7	13	30	--	--	--