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RV COLLEGE OF ENGINEERING®

(An Autonomous Institution Affiliated to VTU)

II Semester B. E. Fast-Track Examinations Jan-2024

(Common to AI, BT, CS, CY, CD & IS)

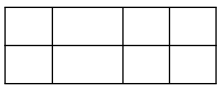
NUMBER THEORY, VECTOR CALCULUS AND COMPUTATIONAL METHODS

Time: 03 Hours ***Maximum Marks: 100***

Instructions to candidates:

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. In Part B question number 2 is compulsory. Answer any one full question from 3 and 4, 5 and 6, 7 and 8, 9 and 10.
3. Formula book to be provided.

PART-A

1	1.1	The number of positive divisors of the integer 1412 is _____.	02
	1.2	Remainder obtained when is divided by 19 is _____.	02
	1.3	The directional derivative of at along the unit vector is _____.	02
	1.4	A particle moves along the curve , then the velocity and acceleration at any point is _____ and _____.	02
	1.5	If then evaluate along the straight line from to .	02
	1.6	If and is the region bounded by the cube , , then is _____.	02
	1.7	The Wronskian of the function and is _____.	02
	1.8	Reduce the Cauchy-Euler differential equation to linear differential equation with constant coefficients.	02
	1.9	Construct the difference table for the following data. 	02
	1.10	Using Lagrange's interpolation fit a polynomial for the data. 	02

PART-B

2	a	By using the Euclidean algorithm, obtain the greatest common divisor of and and then find integers and to satisfy . Also show that and are not unique.	08
	b	Given the public key encrypt plain text , where the alphabets are assigned the numbers . Give the cipher text and find the private key .	08
3	a	Find the angle between the normal to the surface at the points and	08
	b	Compute the values of the constants such that is curl free vector. Determine the scalar potential function such that .	08
		OR	
4	a	Find and for at .	08

	b	If and , then show that is solenoidal.	08
5	a	Evaluate where along i) The path of the straight line from to and then to (ii) The straight line joining the origin and	06
	b	Using Stokes theorem to evaluate where is the boundary of the triangle with vertices and .	10
		OR	
6	a	Using Green's theorem, evaluate where is the boundary of the region enclosed by the lines , .	06
	b	Evaluate the if and is the surface of the sphere in the first octant.	10
7	a	Using the method of variation of parameters, solve the differential equation .	08
	b	Solve the differential equation .	08
		OR	
8	a	Reduce the differential equation to a linear differential equation with constant coefficients and hence solve the same.	08
	b	The current in an circuit is governed by the differential equation A circuit has in series an electromotive force given by volts, a resistor of ohms, an inductor of henry and a capacitor of farads. If the initial current and the initial charge on the capacitor are both zero, find the charge on the capacitor at any time	08
9	a	The following data was collected for the distance travelled versus time: Use numerical differentiation to calculate velocity and acceleration at and .	08

	b	From the following data, estimate the number of students who obtained marks between and using Newton's interpolation method	08
		OR	
10	a	The following data defines the sea-level concentration of dissolved oxygen for fresh water as a function of temperature. Using Newton-Gregory formula, calculate the amount of oxygen, when temperature is and .	08
	b	Find a polynomial by using Lagrange's interpolation formula and hence find for the following data	08