

Institution Affiliated to Visvesvaraya Technological University, Belagavi

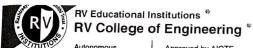
Academic year 2021-2022 (Odd semester 2021)

	DEPARTMENT OF MATHEMATICS									
Date	15 November 2021	Time	10:00 AM to	11: 30 AM						
Test	I	Maximum Marks								
	LINEAR ALGEBRA, LAF	LACE TRANSFORM	Course Code	18MA31A						
Course Title	AND COMBIN	IATORICS	50 Course Code 18MA3							
Semester	III	Programs	CSE &	ISE						

Sl. No.	Questions	M	BT	CO
1.	a) Obtain the frequency domain function for the signal described by the function	4	1	1
	$f(t) = \begin{cases} 1 & ; \ 0 < t < \pi \\ e^t & ; t \ge \pi \end{cases}$			
	b) Evaluate $\int_0^\infty e^{-2t} \frac{\sin^2(t)}{t} dt$ using Laplace transform technique.	6	2	2
2.	a) Convert the time domain function of the signal h (t) = $\left(\sqrt{t} - \frac{1}{\sqrt{t}}\right)^3 + t \sinh(kt)$	4	1	1
	into the frequency domain function using Laplace transform technique.			
1	b) Determine the inverse Laplace transform of the function $\frac{1}{(s^2+4)(s+1)^2}$ using	6	2 .	2
	convolution theorem.			
3.	Evaluate the time response of a system for the following transfer functions:	10	2	3
	(i) $\frac{s+3}{(s+2)(s^2+3s+5)}$ (ii) $\ln \left[\left(\frac{s^2-1}{s(s-3)} \right) \right]$.			
4.	Obtain the Laplace transform of a saw tooth wave function of period T given	10	3	2
`	by $f(t) = -a + 2a\frac{t}{T}$; $0 \le t < T$. Also sketch the waveform of $f(t)$.			<u>.</u>
(5.)	Apply the Laplace transform technique to compute the solution y (t) of the second	10	3	4
	order differential equation $ty'' + 2y' + ty = 4$ with initial conditions $y(0) =$			
	0,y'(0)=1.			

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

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	COS / BT	COI	CO2	CO3	CO4	Ll	L2	L3	LA	LS	L6
Marks Distribution	Max Marks	08	22	10	10	8	22	20	-	•	
				to also also							

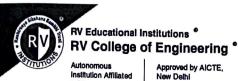


	RV College of	of Engineering [®]			
Ir to Tr	autonomous nstitution Affiliated o Visvesvaraya echnological	Approved by AICTE, New Delhi			
	Iniversity, Belagavi Ad	cademic year 2021	-2022 (Odd semester	2021)	
		DEPARTMENT	Γ OF MATHEMAT	ICS	
Date	03	3 January 2021	Time	10:00 AM to	11: 30 AM
Test		II	Maximum Marks	50	
Course T	itle LINE	AR ALGEBRA, LAF AND COMBIN	PLACE TRANSFORM	Course Code	18MA31A
Semeste	er	III	Programs	CSE &	ISE

SI. No.	Questions	M	BT	CO
1.	Verify whether the following sets forms a subspace or not. Justify your answer.	10	1	1
	a) $P = \{ a_0 + a_1x + a_2x^2 + a_3x^3, \text{ set of polynomials of degree 3 for which } a_0 = 0 \}.$		-	
	b) $M = \{M_{2 \times 2}, \text{ the set of all } 2 \times 2 \text{ matrices such that } A = 0\}.$			
	c) $S = \{(x, y) \text{ such that either } x = 0 \text{ or } y = 0\} \text{ in } \mathbb{R}^2$.			-
	d) $F = \{The set of all polynomials f's such that f(0) = 1\}.$			
	e) $S = \{(x, y, z): x^2 + y^2 + z^2 \le 1\}$ in \mathbb{R}^3 .			
2.	a) Determine a value for q such that the following vectors are linearly independent			
	$\{(1, 1, 2, 1), (2, 1, 2, 3), (1, 4, 2, 1), (-1, 3, 5, q)\}.$	4	1	1
	(c) 4, 4, 4, 5, (1, 4, 2, 1), (-1, 3, 3, 4)}. (b) Is there a linear transformation T: $\mathbb{R}^2 \to \mathbb{R}^3$ such that T (1, 1) = (1, 0, 2) and			
!	T(2, 3) = (1, -1, 4)? If so compute $T(0, 0)$ and $T(8, 11)$.	6	2	2
(3)	Let $\Phi: \mathbb{R}^4 \to \mathbb{R}^3$ be a linear mapping such that $\Phi(x, y, z, w) = (x + y + 2z + 3w)$			
	$x + z - w$, $x + 2y$). Compute the kernel and image of Φ . What are dim (ker (Φ))	10	3	3
	and dim (image (Φ)) relative to the bases $B_1 = \{(1, 1, 1, 2) (1, -1, 0, 0) (0, 0, 1, 1) (0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,$			
	$(1, 0, 0), B_2 = \{(1, 2, 3) (1, -1, 1) (2, 1, 1)\}.$			_
4.				
	Let A= $\begin{bmatrix} 1 & 2 & 3 & -1 \\ 2 & -1 & -4 & 8 \\ -1 & 1 & 3 & -5 \\ -1 & 2 & 5 & -6 \\ -1 & -2 & -3 & 1 \end{bmatrix}$	10	2	2
	Let $A = \begin{bmatrix} -1 & 1 & 3 & -5 \\ 1 & 2 & 5 & 5 \end{bmatrix}$			
	(a) Determine the basis and dimension for row space and column space of A.			
	(b) Determine the basis and the dimension for the set of solutions of $\Delta x = 0$			
5.	(b) Verify fank – nullity theorem.			
	Apply the Gram-Schmidt process to construct an orthonormal basis for the subspace	10	3	4
	W = span (x_1, x_2, x_3) of R ⁴ , where $x_1 = \begin{bmatrix} 1 \\ -1 \\ 1 \\ -1 \end{bmatrix}$, $x_2 = \begin{bmatrix} 5 \\ 1 \\ 1 \\ 1 \end{bmatrix}$, $x_3 = \begin{bmatrix} 2 \\ 3 \\ 4 \\ 1 \end{bmatrix}$.			

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Marks Distribution -	COS / BT	COI	CO2	CO3	CO4	T.1	12	13	T A	15	TC	1
	Max Marks	1.4	1.0						L4	LO	ro	ı
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University, Belagavi Academic year 2021-2022 (Odd semester 2021)

	DEPARTMENT OF MATHEMATICS									
Date	14 March 2022	Time	10:30 AM to	12:00 PM						
Test	III	Maximum Marks	50	1						
Course Title	LINEAR ALGEBRA, LAF AND COMBIN		Course Code	18MA31A						
Semester	III	Programs	CSE &	ISE						

Sl. No.	Questions	3.5	DOT	-
		M	BT	CO
	Three measurements are made on each of two individuals in a random sample from a	10	3	4
1	population. The matrix of the observation vectors is $M = \begin{bmatrix} 3 & 2 \\ 2 & 3 \\ 2 & -2 \end{bmatrix}$. Obtain a singular			
	value decomposition of M.			
	Use the inclusion-exclusion principle to count the number of integers in $S = \{1, 2, \dots, 2\}$	10	2	2
	3,, 2000} in the following cases:			
2	a) Divisible by 9 or 11 or 13.			
	b) Divisible by at least two of 9, 11, 13.			
	c) Divisible by exactly two of 9, 11, 13.		-	
	Given the public key $(e, n) = (7, 55)$, encrypt plain text M I T, where the alphabets	10	3	. 4
3	{A, B, C, X, Y, Z} are assigned the numbers {5, 6,, 29, 30}. Give the cipher text.			
	Obtain the private key d.			1 114 41
	By using the Euclidean algorithm, find the greatest common divisor d of 1819 and	6	2	2
_4a	3587 and then find the integers x and y to satisfy $1819 x + 3587 y = d$.			
- 4b	Compute all the solutions of the linear congruence $6x \equiv 15 \pmod{21}$.	4	1	1
	Four fruits {F ₁ , F ₂ , F ₃ , F ₄ } are to be distributed to four people {P ₁ , P ₂ , P ₃ , P ₄ }. P ₁ and	6	3	3
	P ₂ do not wish to have fruit F ₁ , P ₃ does not want F ₂ or F ₃ and P ₄ refuses F ₄ . Using			
5a	rook polynomial determine the number of ways the distribution can be made so that			
	none of them displeased.			
	Obtain the number of positive divisors and sum of all positive divisors of 810 and	4	1	1
5b	also determine the Euler's Phi function $\phi(810)$.			
1	also determine the Edier's Phi function ψ(610).			

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

Marks Distribution	COS/BT	CO1	CO2	CO3	CO4	L1	L2	L3	L4	L5	L6
Marks Distribution	Max Marks	08	16	06	20	08	16	26	-	-	-