VIT®

Vellore Institute of Technology

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Continuous Assessment Test II – October 2022

Programme	:	B.Tech.	Semester	:	Fall 2022 – 23
Course Title	:	Linear Algebra and Transform Techniques	Code	:	MAT3008
			Slot	:	E1+TE1
Faculty (s)	:	Dr. Poulomi De, Dr. Sushmitha P	Max. Marks	:	50
Class Nbr.	:	CH2022231001856, CH2022231001859	Time	:	90 minutes

Answer all the Questions (5X10=50)

Q.No.	Sub. Sec.	Question Description	Marks
1.	a.	If $T: V_3 \to V_2$ and $T(x_1, x_2, x_3) = (x_1 - x_2, x_1 + x_3)$, then show that T is a linear transformation.	7
	b.	Consider the mapping $F: R^3 \to R^2$ defined by $F(x, y, z) = (xz, y^2)$. Find F (5,-2,3) and $F^{-1}(0,0)$.	3
2.		Let T be the linear operator on $T: R^3 \to R^3$ defined by $T(x_1, x_2, x_3) = (-2x_1 + x_2, -x_1 + 2x_2 + 4x_3, 3x_1 + x_3)$. Find the matrix of T in the ordered basis $\{\alpha_1, \alpha_2, \alpha_3\}$, where $\alpha_1 = (-1,2,1)$, $\alpha_2 = (2,1,1)$ and $\alpha_3 = (1,0,1)$.	10
3		Apply the Gram-Schmidt process to the vectors (1,0,1),(1,0,-1),(0,3,4) to find an orthonormal basis for $V_3(R)$ with the standard product.	10
4		Consider the following polynomials in P(t) with the inner product $< f, g >= \int_0^1 f(t)g(t)dt$ and $< f, h >= \int_0^1 f(t)h(t)dt$ where $f(t) = t + 2$, $g(t) = 3t - 2$ and $h(t) = t^3 - 2t - 3$ a) Find $< f, g >$ and $< f, h >$ b) Find $\|f\|$ and $\|g\|$ c) Normalize f and g.	10
5		Let $F: R^4 \to R^3$ be the linear mapping defined by $F(x, y, z, t) = (x - y + z + t, 2x - 2y + 3z + 4t, 3x - 3y + 4z + 5t)$. Find basis and dimension of (a) Image of F and (b) Kernel of F.	5+5

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