COMSATS, University Isalmabad, Lahore Campus

Terminal Examination – Semester Sp2021

Course Title:	Linear Algebra			Course	MTH-231	Credit Hours:	3(3,0)
Course Instructor/s:	Dr. Tariq Zia,Dr.Zubair, Dr. Aqeel.K, Dr.. Maqsood A.			Programme Name:	BCS, BEE		
Semester:	2nd -4th	Batch:	Section:		Date:	July 02, 2021	
Time Allowed:	**3.00 hrs.**			**Maximum**		**100**	
Student's Name:				Reg.	/LHR		

Important Instructions / Guidelines:

- Attempt all Questions
- Upload answer sheet on portal as instructed by teacher rather to send through email.
- Turn on your camera while you are in exam.

Q # 01 (07+08+05)

Let $L: P_1 \to P_1$ by defined by

$$L(t+1) = t-1, \quad L(t-1) = 2t+1$$

(a) Find the matrix of L with respect to the basis $S = \{t+1, t-1\}$ for P_1.

(b) Find $L(2t+3)$ using ***definition of L*** and, also ***using the matrix*** obtained in (a).

(c) Find $L(at+b)$.

Q # 02(10+10)

Let $L: M_{22} \to M_{22}$ be linear transformation defined by

$$L\left(\begin{bmatrix} a & b \\ c & d \end{bmatrix}\right) = \begin{bmatrix} a+b & b+c \\ a+d & b+d \end{bmatrix}$$

(a) Find a basis for $\ker L$

(b) Find a basis for $Range\ L$

Q # 03 (10)

Let $A = \begin{bmatrix} 2 & 0 & 0 \\ 1 & 2 & 1 \\ 0 & 1 & 2 \end{bmatrix}$

Find ***two matrices*** that are ***similar*** to matrix A.

Q # 04 (10+10)

(a) Find ***orthonormal basis*** for the solution space of the homogeneous system

$x + y - z = 0,\ \ 2x + y + 2z = 0$

(b) Let $S = \{v_1, v_2\}$ & $T = \{w_1, w_2\}$ be bases for P_1. Where $w_1 = t,\ w_2 = t - 1$.

If matrix from S $to\ T$ is $\begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$, determine S.

Q # 05 (10+10+10)

(a) Find a basis for column space of matrix $A = \begin{bmatrix} 1 & -2 & 5 \\ 2 & 3 & 2 \\ 0 & -7 & 8 \end{bmatrix}$, consisting of the vectors ***that are not column vector*** of A

(b) Do the polynomials $t^2 + 2t + 1,\quad t^2 - t + 2,\quad t^3 + 2,\quad -t^3 + t^2 - 5t + 2$ span P_3?

(c) Let V be the set of all real numbers defined $\oplus$ by $u \oplus v = 2u - v$ and $\odot$ by $c \odot u = cu$. Is V a vector space?

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