National University of Computer and Emerging Sciences

LINEAR ALGEBRA – CS, Fall 2015

Final Exam

Roll# L 12-4129 Name_____ Section_____ Date Dec 12, 2015

Time: 3 Hours Max Marks: 50

Note: *Only simple calculators are allowed.*

Q#1 [10] For election campaign in the Election 2015 a candidate spent some amounts on T.V., newspapers, and internet.
The amount spent on T.V., newspapers and internet is Rs. 6.5 millions.
The amount spent on newspapers and internet is Rs. 3.5 millions.
The amount spent on T.V. and internet is Rs. 4.5 millions.
Using Gaussian elimination method, find how much money was spent on each medium.

Q#2 [10] Let $V_1 = (1, -4, 2, -3)$, $V_2 = (-3, 8, -4, 6)$
Choose the vectors from
$u_1 = (0, 0, 1, 0)$
$u_2 = (4, -12, 6, -9)$
$u_3 = (-2, 4, -2, 3)$
$u_4 = (0, 0, 0, 1)$
That can be added to the set $\{V_1, V_2\}$ to produce a basis for R^4.

|A| = 0 No basis
|A| ≠ 0 form Basis

Q#3 [10] Find a matrix P that diagonalizes A. Find P^{-1} and hence compute $P^{-1}AP$. where

$$A = \begin{bmatrix} 2 & 0 & -2 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

Q#4 [10] Let R^4 have the Euclidean inner product, use the Gram-Schmidt process to transform the basis $\{u_1, u_2, u_3, u_4\}$ into an orthonormal basis, where

$u_1 = (0, 2, 1, 0)$, $u_2 = (1, -1, 0, 0)$, $u_3 = (1, 2, 0, -1)$, $u_4 = (1, 0, 0, 1)$

Q#5 [10] In the annual competition 2015 of Lahore School of Arts, the best model was awarded Rs.1,000,000/=. It was model of Badshahi Mosque Lahore in which an artist made the

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point (-1, 2, 4) of the model for the actual point $V_1 = (1, 1, 1)$ of Badshahi mosque. mathematically $T(V_1) = (-1, 2, 4)$.

Similarly for the other two points $V_2 = (1, 1, 0)$ and $V_3 = (1, 0, 0)$. The following rules can be described

$T(V_2) = (0, 3, 2)$ and $T(V_3) = (1, 5, -1)$. Consider $S = \{V_1, V_2, V_3\}$ as the basis for R^3 and $T: R^3 \rightarrow R^3$ as linear operator. Find the formula for $T(x_1, x_2, x_3)$. Hence find the point of the model corresponding to the actual point (-3, 10, 7) of the mosque.