



• Answer all Questions

First Question	No. of Branches (2)	(10/50)
<u>Q1 B1</u>		<u>(5/10)</u>

a. For:  $A = \begin{bmatrix} 0.5 & 0 & 0 \\ 0 & -3 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ , Find  $A^{-3}$

b. By inspection, show that the matrix  $B$  is invertible but the matrix  $C$  is not.

$$B = \begin{bmatrix} 3 & 0 & 0 \\ 1 & -7 & 0 \\ 2 & 3 & 5 \end{bmatrix}$$

$$C = \begin{bmatrix} 2 & 6 & 8 \\ 0 & 0 & 7 \\ 0 & 0 & 4 \end{bmatrix}$$

<u>Q1 B2</u>		<u>(5/10)</u>
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a. Find the norm of the vector  $v = (-1, 2, 3)$

b. Calculate the dot Products  $u \cdot v$  for the following vectors:

$$u = (-1, 2, 3, 6), \quad v = (-3, 2, 0, 1)$$

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Course Title: MATH2-IT

Date: 30 /5/ 2017  
No. of Questions: 4  
Time: 2hours  
Using Calculator (yes)

University of Palestine



Final Exam  
2nd Semester-2016/2017  
Total Grade: 50

Instructor Name: Dr. Anwar Mousa  
Student No.: \_\_\_\_\_  
Student Name: \_\_\_\_\_  
College Name: Faculty of Information Technology  
Dep. / Specialist: \_\_\_\_\_  
Using Dictionary (No)

c. Show that  $l = (-2, 3, 1, 4)$  and  $m = (1, 2, 0, -1)$  are orthogonal vectors.

**Second Question**

**No. of Branches (2)**

**(15/50)**

**Q2 B1 (10/15)**

Determine whether the vectors  $v_1 = (1, 3, 2)$ ,  $v_2 = (1, 0, 2)$ , and  $v_3 = (0, 1, 4)$  span the vector space  $\mathbb{R}^3$ .

*Hint:* Determine whether an arbitrary vector  $\mathbf{b} = (b_1, b_2, b_3)$  in  $\mathbb{R}^3$  can be expressed as a linear combination,  $\mathbf{b} = k_1\mathbf{v}_1 + k_2\mathbf{v}_2 + k_3\mathbf{v}_3$

**Q2 B2 (5/15)**

Show that the matrices

$$M_1 = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}, \quad M_2 = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}, \quad M_3 = \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}, \quad M_4 = \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$$

form a basis for the vector space  $M_{22}$  of  $2 \times 2$  matrices.

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Third Question	No. of Branches (1)	(10/50)
<u>Q3 B1</u>		<u>0</u>

Show that the vectors  $v_1 = (2, 1, 3)$ ,  $v_2 = (2, 4, 0)$ , and  $v_3 = (1, 1, 5)$  form a basis for  $\mathbb{R}^3$ .

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Fourth Question	No. of Branches (1)	(15/50)
<u>Q4 B1</u>		<u>(10/15)</u>

a. Find bases for the row and column spaces of the matrix R

$$R = \begin{bmatrix} 1 & -3 & 4 & -2 & 5 & 4 \\ 0 & 0 & 1 & 3 & -2 & -6 \\ 0 & 0 & 0 & 0 & 1 & 5 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

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b. Knowing that the matrix  $R$  is a row echelon form of the following matrix  $A$ , find bases for the row and column spaces of the matrix  $A$ .

$$A = \begin{bmatrix} 1 & -3 & 4 & -2 & 5 & 4 \\ 2 & -6 & 9 & -1 & 8 & 2 \\ 2 & -6 & 9 & -1 & 9 & 7 \\ -1 & 3 & -4 & 2 & -5 & -4 \end{bmatrix}$$

**Q4 B2**

**(5/15)**

(a) Find the number of parameters in the general solution of  $Ax = 0$  if  $A$  is a  $4 \times 6$  matrix of rank 3.

(b) Find the rank of a  $3 \times 5$  matrix  $A$  for which  $Ax = 0$  has a two-dimensional solution space.

**End of Questions**