


Benha University Faculty of Engineering- Shoubra Eng. Mathematics & Physics Department <b>Postgraduate Studies</b> <b>Qualifying Courses</b>		Final Term Exam Date: 11 – 1 – 2014 Course: Linear Algebra Code: EMM 402 Duration: 3 hours	
<ul style="list-style-type: none"><li>• Answer all the following questions</li><li>• The Exam Consists of One page</li></ul>		<ul style="list-style-type: none"><li>• No. of questions: 5</li><li>• Total Mark: 200</li></ul>	
<p>[1] (a)Determine the linearly independent and linearly dependent:</p> <p>(i) <math>u = (1, 2), v = (2, 4)</math> (ii) <math>u = (2, 1, 2), v = (1, 2, 0), w = (1, 3, 2)</math></p> <p>(b) If <math>A = \begin{bmatrix} 1 &amp; 2 &amp; 1 \\ 0 &amp; 4 &amp; 3 \end{bmatrix}</math> and <math>A = \begin{bmatrix} 2 &amp; -2 \\ 0 &amp; 3 \\ 1 &amp; -1 \end{bmatrix}</math>.</p> <p>Find, if possible, <math>A + B, A + B^t,  AB ,  BA </math>.</p>			10 30
<p>[2](a)If <math>A = \begin{bmatrix} 2 &amp; 0 &amp; -2 \\ 0 &amp; 4 &amp; 0 \\ -2 &amp; 0 &amp; 5 \end{bmatrix}</math>.</p> <p>(i)Show that <math>A^t.A</math> is symmetric matrix.</p> <p>(ii)Find the eigenvalues and the eigenvectors and write the Hamilton equation.</p> <p>(b) Show that the eigenvalues of : <math>A = \begin{bmatrix} a &amp; n \\ n &amp; b \end{bmatrix}</math> are real numbers, where <math>a, b, n</math> are real numbers.</p>			10 30 10
<p>[3]Write the following expressions in matrix form and determine the type:</p> <p>(a) <math>P = (2x - y + z)^2 + 2xy - 2xz + yz</math></p> <p>(b) <math>P = 2xy + 4xz - 2yz - 3x^2 - 2y^2 - 2z^2</math></p> <p>(c) <math>P = 4xy + 5xz - 2yz + 3x^2 + y^2 + z^2</math></p>			30
<p>[4](a)Write the Hessian matrix of : <math>f(x,y,z) = ye^x + y^4z^5 + 3</math> at <math>(0, 1, 1)</math>.</p> <p>(b)If <math>A = \begin{bmatrix} 1 &amp; 0 &amp; 2 \\ 0 &amp; 3 &amp; 0 \\ 0 &amp; 1 &amp; 4 \end{bmatrix}</math>. Find <math>B = f(A) = \frac{170A}{A^2+I}</math>.</p>			10 30
<p>[5](a)Write the equations: <math>a_{11}x + a_{12}y + a_{13}z = b_1, a_{21}x + a_{22}y + a_{23}z = b_2,</math> <math>a_{31}x + a_{32}y + a_{33}z = b_3</math> in matrix form and discuss the types of solutions. Also, state two methods with their procedures for solving this linear system.</p> <p>(b)Determine the type of solution of the linear system:</p> <p><math>2x - y + 3z = 2, \quad x + 2y - z = 3, \quad 3x + y + 2z = 4</math></p>			30 10

*Good Luck*

*Dr. Mohamed Eid*