Benha University		Final Term Exam
Faculty of Engineering- Shoubra		Date: 9 – 1 – 2013
Eng. Mathematics & Physics Department		Course: Linear Algebra
Postgraduate Studies		Code: EMM 402
Qualifying Courses		Duration: **3** hours

- Answer all the following questions
- The Exam Consists of One page

- No. of questions: 5
- Total Mark: 200 Marks

Marks 200

[1] (a)Determine the linearly independent and linearly dependent: — 20

(i) $u = (2, 1)$, $v = (4, 2)$ (ii) $u = (2, 1, 3)$, $v = (1, 2, 4)$, $w = (1, 0, 2)$

(b)If $L: R^2 \to R^3$ is given by: $L(x, y) = (x + y, \ x - y, \ 2x + y)$.

Show that L is linear transformation and write its matrix. — 20

[2](a)If $A = \begin{bmatrix} 1 & 0 & 2 \\ 2 & 1 & 3 \\ 0 & 1 & 2 \end{bmatrix}$. Show that $A.A^t$ is symmetric matrix. — 10

(b)If $A = \begin{bmatrix} a & b \\ b & c \end{bmatrix}$, where a, b, c are real numbers. — 15

Show that the eigenvalues of A are real numbers.

(c)Show that the eigenvectors of $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ are linearly independent. — 15

[3]Write the following expressions in matrix form and determine the type: — 30

(a) $P = (2x - 3y + z)^2 + 8xy - 6xz - yz$

(b) $P = 2xy + 4xz - 2yz - 3x^2 - 2y^2 - 2z^2$

(c) $P = xy + xz - 2yz - 3x^2 - 2y^2 + z^2$

[4](a)Write the Hessian matrix of the function $f = ze^{xy} + \sin(yz)$. — 10

(b)If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 3 & 0 \\ 0 & 1 & 4 \end{bmatrix}$. Find $B = f(A) = \dfrac{170A}{A^2 + I}$. — 30

[5](a)Write the equations: $a_{11}x + a_{12}y + a_{13}z = b_1$, $a_{21}x + a_{22}y + a_{23}z = b_2$, — 10

$a_{31}x + a_{32}y + a_{33}z = b_3$ in matrix form and discuss the types of solutions.

(b)If M is the set of all square matrices of order 2x2. — 30

(i)Show that M is linear space over R.

(ii)Determine the base.

(iii)Show that the set of all diagonal matrices of order 2x2 is subspace of M.

Good Luck   *Dr. Mohamed Eid*