Benha University Faculty of Engineering- Shoubra Eng. Mathematics & Physics Department Preparatory Year		Final Term Exam Date: 17 – 5 – 2014 Course: Mathematics 1 – B Duration: **3** hours
• Answer **All** Questions • The Exam consists of one page		• No. of questions: 4 • Total Mark: 100

Question 1

(a)(i)Complete: The eigenvalues of a symmetric matrix of real numbers are… 4

(ii)State the types of solutions of a linear system AX = B.

(b)If $A=\begin{bmatrix}0 & -2 & -1\\ 1 & 2 & 0\\ 3 & 0 & -3\end{bmatrix}$, $B=\begin{bmatrix}1 & 2\\ 0 & 3\\ 2 & -1\end{bmatrix}$. Find, if possible, A + B, A.A`, A.B, |A|, |B| 6

(c) If $A=\begin{bmatrix}2 & -1\\ 4 & -3\end{bmatrix}$. Find (i)The eigenvalues and eigenvectors of A 15

(ii)The eigenvalues of $f(A)=A^5-2A$ (iii) $f(A)=A^n$

Question 2

(a)Solve the linear system: $y-z=-3$, $x+2y+2z=3$, $x+3y+z=0$, $2x+y-z=-1$ 5

(b)Find S , S_{10} from: (i) $\sum_{r=1}^{n}(r+1)(r+2)$ (ii) $\sum_{r=1}^{n}\frac{1}{r^2+3r+2}$ (iii) $\sum_{r=1}^{n}\frac{2r+3}{[(r+1)(r+2)]^2}$ 12

(c)Using the mathematical induction, prove that:

(i) $\frac{1}{1x3}+\frac{1}{3x5}+\frac{1}{5x7}+\cdots+\frac{1}{(2n-1)(2n+1)}=\frac{n}{2n+1}$ (ii)If $y=\frac{1}{1+2x}$, then $y^{(n)}=\frac{(-2)^n.n!}{(1+2x)^{n+1}}$ 8

Question 3

(a)Write down the equation for a rotation of axis through an angle $\pi/4$. Hence prove that the curve $2xy=a^2$ cane be transformed to $x^2-y^2=a^2$. 5

(b)Find the equation of the parabola with focus at $(3,-4)$ and the directrix is $6x-7y+5=0$. 8

(c)Find the equation of the ellipse whose foci $(\pm 4,\ 0)$ and its eccentricity is $1/3$. 8

(d)Find the equation of the circle with center at $(6,6)$ and touch the circle $x^2+y^2=32$. 5

Question 4

(a)Find the equation of the twotangents of the hyperbola $9x^2-4y^2=36$drawn from the point $(0,9)$. Find the angle between them. 8

(b)Prove that the circle $x^2+y^2-2ax-2ay+a^2=0$ touch the axis. 8

Hence find the equation of the circle which touches the axis at a distance 4 from the origin.

(c)What conic the equation $4x^2-9y^2-16x+54y-101=0$ represent ? 8

Find its foci and equation of its directrix.

Good Luck *Dr. Mohamed Eid* *Dr. Fathi Abdsallam*

Mid-Term Exam Algebra (12– 4 –2014) Time: 1 hour Total mark: 20

Algebra	**Group**	**Section**	**No.**	**الإسم:**

[1]Complete the following statements:

(a)A square matrix A is called symmetric if.....

(b)A square matrix A is called singular if.....

(c)A square matrix A has inverse if.....

[2]If $A = \begin{bmatrix} 2 & 4 \\ 1 & -1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 3 & 2 \\ 2 & 0 & -1 \end{bmatrix}$.

(a)Find if possible: A + B, A.B and B.A

(b)Find the eigenvalues and eigenvectors of A

(c)Find the eigenvalues of $f(A) = A^3 - 2A$

(d)Find the eigenvalues of $f(A) = 2^A$

(e)Find A^n

Benha University Faculty of Engineering- Shoubra Eng. Mathematics & Physics Department Preparatory Year		Final Term Exam Date: 14 – 6 – 2014 Course: Mathematics 1 – B Duration: **3** hours
• Answer **All** Questions • The Exam consists of one page (تخلفات)		• No. of questions: 4 • Total Mark: 100

Question 1

(a)If $A = \begin{bmatrix} 0 & -2 & -1 \\ 1 & 2 & 0 \\ 3 & 0 & -3 \end{bmatrix}$. Show that A + A`, A.A` are symmetric matrices and find |A| — 5

(b)If $A = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$. — 15

(i)Find the eigenvalues and eigenvectors of A (ii)Write and satisfy Hamilton equation

(iii)Find the eigenvalues of $B = A^2 - 2A$

(c) Solve the linear system: x + 2y – 2z = 2, 2x + y + 3z = 2, 3x + 3y + z = 4. — 5

Question 2

(a)If $z_1 = 2 - i$, $z_2 = -1 + 2i$. Find $z_1.z_2$, z_1/z_2 and $(z_1 + z_2)^9$ — 6

(b) Find S , S_{12} from each series: (i) $\sum_{r=1}^{n} r^2(2r-1)$ (ii) $\sum_{r=1}^{n} \frac{2}{4r^2-1}$ — 8

(c)Using the mathematical induction, prove that:

(i) $\frac{1}{2x5} + \frac{1}{5x8} + \frac{1}{8x11} + \cdots n - term = \frac{n}{6n+4}$ (ii) $n^3 + 2n$ is divisible by 3 — 8

(d)Using the binomial theorem, expand : $\frac{1}{3x-2}$ — 3

Question 3

(a)Find the equations of straight lines bisecting the angle between the pair of lines: $4x^2 - 24xy + 11y^2 = 0$. — 9

(b)Find the equation of the tangent to the circle: $x^2 + y^2 - 6x + 4y - 12 = 0$ which parallels to the line: 4x + 3y + 5 = 0. — 8

(c)Find the equation of the parabola where its focus at (0, 3) and D: x = 1. — 8

Question 4

(a)Find the latus rectum, eccentricity and the foci of the ellipse: $x^2 + 2y^2 + 4x + 4y - 2 = 0$. — 9

(b)Find the equation of hyperbola whose eccentricity 5/4 and focus at (a, 0) and directrix 4x – 3y – a = 0. — 8

(c)Find the equation of the plane passing through the line: 2x + 3y + 4z = 16, 4x + y + 6z = 14 and parallels to the plane: x – y + z + 6 = 0. — 8

Good Luck *Dr. Ibrahim Sakr* *Dr. Mohamed Eid*