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| Benha University<br>Faculty of Engineering- Shoubra<br>Eng. Mathematics & Physics Department<br>Preparatory Year | Final Term Exam<br>Date: May 30, 2015<br>Course: Mathematics 1 – B<br>Duration: **3** hours |
| • Answer **All** Questions The Exam consists of one page | • No. of questions: 4 Total Mark: 100 |

## Question 1

(a)Complete: (i)If $\lambda_1, \lambda_2, \lambda_3$ are all eigenvalues of a matrix A. Then |A| is…. **2**

(ii)A linear system AX = B is called consistent if….

(b)If $A = \begin{bmatrix} 0 & 2 & -1 \\ 1 & 3 & 0 \\ 1 & 0 & -2 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 2 \\ 0 & 1 \\ 3 & -1 \end{bmatrix}$. Find, if possible, A + B, A.A\`, B.A, A + 2I, |A| **8**

(c) If $A = \begin{bmatrix} 2 & 1 \\ 4 & -1 \end{bmatrix}$. Find (i)The eigenvalues and eigenvectors of A **8**

(ii)The eigenvalues of $f(A) = \ln(A^2 + A)$ (iii) $A^n$ **2+5**

## Question 2

(a)Solve the L.S : 2x – y + z = 1, 4x + 2y + 2z = 3, – 2x + 3y – z = 0, x + z = 2 **4**

(b)Find S , $S_{10}$ from: (i) $\sum_{r=1}^{n}(r+1)(2r+1)$ (ii) $\sum_{r=1}^{n} \frac{2}{r^2+4r+3}$ **6**

(c)Using the mathematical induction, prove that:

(i) $1.1! + 2.2! + 3.3! + \cdots + n.n! = (n+1)! - 1$ (ii) $y^{(n)} = \sin(x + \frac{n\pi}{2})$ where $y = \sin x$ **8**

(d)If $z_1 = 1 + i,\ z_2 = -2 + 2i$. Find $z_1 + z_2$ , $z_1.z_2$ , $\sqrt[2]{z_1}$ , $(z_2)^7$ **5**

(e)Using the binomial theorem, expand $\frac{1}{1-2x+x^2}$ . **2**

## Question 3

(a)Determine the locus of the middle points of chords of the parabola $y^2 = 4ax$ which passes through vertex (0, 0). **6**

(b)Prove that the equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents two parallel lines if $h^2 = ab$ and $af^2 = bg^2$ . **6**

(c)Find the equation of the bisectors for: $2x^2 + xy - 3y^2 - 6x - 14y - 8 = 0$ **6**

(d)Show that the equation $x^2 + 4y^2 + 4x + 8y - 8 = 0$ represents an ellipse. **7**

Determine its major, minor axis, foci and its vertices.

## Question 4

(a)Derive the equation of the chord of the hyperbola $25x^2 - 16y^2 = 400$ which bisected at the point (5, 2). **7**

(b)Find the equation of the circle which passes through the points (8, 9), (1, 2) and cut the circle $x^2 + y^2 = 25$ at a right angle. **6**

(c)Trace the curve : $y^2 + 4x + 2y - 11 = 0$ . **6**

(d)Find the equation of hyperbola whose eccentricity is 5/2 and focus at (a,0) and its directrix is 4x – 3y – a = 0. **6**

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

**<u>Prep-Year Mid-Term Exam Model A March 23, 2015</u>**

**<u>Total Mark: 20 Mathematics 1-B (Algebra) Time: 30 Minutes</u>**

[1]Complete the following statements:

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

(b)A square matrix A has inverse if………………………………………………………………

(c)The eigenvalues of a symmetric matrix of real numbers are………………………………

and the eigenvectors are…………………………………………………………………...

[2]If $A = \begin{bmatrix} 1 & 3 \\ 1 & -1 \end{bmatrix}$. Find: (a)Find the eigenvalues and eigenvectors of A

(b)Find $A^n$ (c)Find the eigenvalues of $A^{10}, \ 10^A, \ A^{-1}$

[3] If $A = \begin{bmatrix} 1 & -1 & 1 \\ 0 & 2 & 1 \\ 1 & -1 & 3 \end{bmatrix}$. Show that $A.A`$ is symmetric matrix.

**Prep-Year** **Mid-Term Exam** **Model AA** **March 23, 2015**

**Total Mark: 20** **Mathematics 1-B (Algebra)** **Time: 30 Minutes**

[1]Complete the following statements:

(a)A square matrix A is called non-singular if…………………………………………..

(b)The determinant of a matrix exists if……………………………………………….

(c)If $\lambda_1, \lambda_2, \dots, \lambda_n$ are all eigenvalues of a matrix A, then |A| is …………………………..

[2]If $A = \begin{bmatrix} 0 & 1 \\ 3 & 2 \end{bmatrix}$. Find: (a)Find the eigenvalues and eigenvectors of A

(b)Find $A^n$ (c)Find the eigenvalues of $\frac{10}{A^2+I}$ , $\sqrt{A^2 + 2I}$

[3] Find $A^2$ where $A = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$