Faculty of Engineering Basic Science Department Final Exam: Mathematics II Code: Math 102 Answer All Questions	Modern University for Technology & Information مستقبل الصفوة	Academic year: 2014 / 2015 Semester: Summer Date: July 30, 2015 Examiners: Dr. Mona Samir Dr. Mohamed Eid Time Allowed: **2** Hours
The exam consists of one page	No. of Questions: 4	Total Mark: 40

Question 1 (10 Marks)

(a) Prove using mathematical induction that for all $n \geq 1$, 4

$$1 \times 2 + 3 \times 4 + 5 \times 6 + \cdots + 2n \times (2n-1) = \frac{1}{3} n(n+1)(4n-1)$$

(b)Find the sum of the first **20** terms of the series: $\sum_{r=1}^{n} \frac{1}{(2r-1)(2r+1)}$ 3

(c) Evaluate: $\frac{e^{\frac{3}{4}\pi} \times (3+2i)^5}{(1-6i)^3}$ 3

Question 2 (10 Marks)

(a) Evaluate $(-5+2i)^{4/3}$ 2

(b)Find the eigenvalues and the eigenvectors of the matrix $A = \begin{bmatrix} 2 & 0 & 3 \\ 0 & 3 & 1 \\ 0 & 0 & 4 \end{bmatrix}$. 4

(c)Solve the following linear system using inverse matrix : 4

$y + z + x = 5, \quad -y + 2x + z = 2, \quad -z + 2y + 2x = 4.$

Question 3 (10 Marks)

(a)State the definition of the ellipse. 2

(b) Find the radical axis of the circles and find the points of intersection: 2

$$x^2 + y^2 - 2x - 4y + 4 = 0, \quad x^2 + y^2 - 4x - 2y + 2 = 0$$

(c)Write the equation of parabola where the focus is F(1, 2), directrix is x – 3 = 0. 3

(d) Find vertex, focus and sketch the parabola : $y^2 - 8x - 4y + 20 = 0$. 3

Question 4 (10 Marks)

(a) Determine the type of the curve: $x^2 - 4xy + 4y^2 - x + 3y - 2 = 0$. 2

(b) Determine the type of each surface : 2

(i) $x^2 + y^2 + z^2 - x + 3y = 0$ (ii) $2y^2 + z^2 = 3x^2$.

(c)Determine center, vertices and sketch the ellipse $4x^2 + y^2 + 16x - 4y + 16 = 0$ 3

(d)Find center, vertices and sketch the hyperbola : $x^2 - 4y^2 + 4x - 16y - 16 = 0$ 3

Good luck *Dr. Mona Samir* *Dr. Mohamed Eid*