Communications and Aeronautical Eng. Department Level: 2nd Year Examiner: Dr. Mohamed Eid Time allowed: 3 hours		Semester: Autumn 2019 Final Exam Course: Mathematics III Code: Math 201 Date: January 1, 2020

The Exam consists of one page | Answer all questions | No. of questions: 5 | Total Mark: 80

Question 1 (15 marks)

(1)Solve the linear systems:

(a) $x + y - z = 1, \quad 2x - y + 3z = 4, \quad 2x + 3y - 2z = 3.$ — 3

(b) $x + 2y - z = 6, \; -y + 2x + 2z = 9, \; y + z + 3x = 10.$ — 5

(c)By the iterative method, solve: $x + 3y - 6z = -8, \; -x + y + 2z = 8, \; 4x - y + z = 8.$ — 7

Question 2 (20 marks)

Solve the L.P problems:

(a) Minimize $f = -2x + y - 2z$

Subject to $x + 2y + 2z \le 8, \; 2x + y + 2z \le 12, \; x, y \ge 0.$ — 10

(b) Maximize $f = x + y + z - p$

Subject to $x - y + z - p \le 4, \; x + y - z + p \ge 6, \; x, y, z, p \ge 0.$ — 10

Question 3 (10 marks)

(a)If $V = \{(x, y, z): x, y, z \in R\} = R^3$ is vector space and $U = \{(x, 2x, 3x)\} \subset V$.
Show that U is subspace of V. — 5

(b)Show that $L : R^2 \to R^2$ is linear transformation. Also, write its matrix and find its kernel where $L\begin{bmatrix} x \\ y \end{bmatrix} = L\begin{bmatrix} x - y \\ -2x + 2y \end{bmatrix}$ — 5

Question 4 (15 marks)

(a)Find u, v of $f(z) = \cos z - iz$ and show that they satisfy Remman equations. — 3

(b)If $u = y + e^y \cos x$. Find its conjugate v and write the complex function f(z). — 3

(c)Determine and sketch the image of the ray $y = x$ and $x, y > 0$ by $f(z) = \ln z$. — 3

(d)Determine and sketch the image of the region G by $f(z) = \sin z$ where G is:

$0 \le x \le \pi, \quad 0 \le y \le 3$ — 6

Question 5 (20 marks)

(a)If C is the circle $|z - 1| = 3$. Find the integrals: — 10

(i) $\oint_C \frac{z \cos z}{z^2 + 16} dz$ (ii) $\oint_C \frac{\sin z}{(z - \pi)^2} dz$ (iii) $\oint_C \frac{3^z}{(z - 2)(z + 3)^2} dz$

(b)Find the integrals: — 10

(i) $\int_0^{2\pi} \frac{1}{5 - 3\sin\theta} d\theta$ (ii) $\int_{-\infty}^{\infty} \frac{\cos 2x}{x^2 + 1} dx$ (iii) $\int_{-\infty}^{\infty} \frac{1}{(x - 1)(x^2 + 1)} dx$

Good Luck *Dr. Mohamed Eid*