Credit Hours Programs Program of Elec. Eng. and Control Duration: 2 hours Date : January 11, 2020	Faculty of Eng. – Shoubra	Final Exam Course: Mathematics 3 Code: EMP 201 Group 3174

The exam consists of one page   No. of questions : 4   Answer **All** questions   Total Mark: 40

<u>Question 1</u> (10 marks)

(a)Find the first derivatives of the function F and find ∇F where 3

$F = e^x + \ln(2x + y) - z^3 \cos y.$

(b)Find the envelope of the curves : $(x - 2a)^2 + (y + a)^2 = 1$ 3

(c)Determine the extrema of the function $f(x, y) = 3x + 2y \;\; s.t \;\; 3x^2 + y^2 = 7$ 4

<u>Question 2</u> (10 marks)

(a) Find $\overline{U}_z$, $\nabla.\overline{U}$ and $\nabla x\overline{U}$ where $\overline{U} = (x^2 \sin z)i + (y^3 + e^x)j + (z \cos y)k.$ 3

(b)From the curve : $x = e^{2t}$, $y = t^3$, t in $[0, 2]$.

Find the area A, the arc length L and the volume V_y and the surface area S_x. 4

(c)Findthe integral $\int_{(0,0)}^{(2,4)} (xy^2)dx + (2x + y)dy$ through the curve $x = \sqrt{y}$ 3

<u>Question 3</u> (14 marks)

(a)If $f(z) = z + \cos z$. Show that u(x, y) , v(x, y) satisfy the Riemman's equations. 2

(b)If $u = \cosh x \cos y$. Find its conjugate v and write $f(z) = u + iv$. 2

(c)Determine and sketch the image of the region G : $0 \le x \le 2$, $0 \le y \le \pi$ 4

under the function $f(z) = \cos iz$.

(d)If C is the circle $|z + 1| = 4$. Find the integrals: 6

$$(i) \oint_C \frac{z + \sin z}{z^2 + 36} dz \qquad (ii) \oint_C \frac{\sin z}{(z + \pi)^2} dz \qquad (iii) \oint_C \frac{2^z}{z(z - 2)} dz$$

<u>Question 4</u> (6 marks)

(a)Write the Fourier series of $f(x) = |x|, \; -1 \le x \le 1, \; f(x + 2) = f(x).$

(b)Write the Fourier sine of the function $f(x) = x - 1, \; x \text{ in } [0,2], f(x + 4) = f(x)$

Good Luck   *Dr. Mohamed Eid*

Credit Hours Programs Engineering and Management of Construction Sites Program Duration : 2 hours	Faculty of Eng. – Shoubra	Final Exam Course: Mathematics 3 Code: EMP 201 Date: January 11, 2020

The exam consists of one page   No. of questions : 4   Answer **All** questions   Total Mark: 40

<u>Question 1</u> (10 marks)

(a)Find the first derivatives of the function F and find ∇F, where 3

$F = 3^x + y^3 \ln x - z^3 \sin y$

(b)Find the envelope of the curves : $(x-b)^2 + (y-2b)^2 = 1$ 3

(c)Determine the extrema of the function $f(x,y) = 2x + 3y \;\; s.t \;\; x^2 + 3y^2 = 7$ 4

<u>Question 2</u> (10 marks)

(a) Find $\overline{U}_y$, $\nabla.\overline{U}$ and $\nabla x\overline{U}$ where $\overline{U} = (x^2 \sin y)i + (y^3 - e^z)j + (z\cos x)k$. 3

(b)From the curve : $x = t^3$, $y = e^t$, t in $[1, 2]$.

Find the area A, the arc length L and the volume V_y and the surface area S_x. 4

(c)Findthe integral $\int_{(2,0)}^{(3,1)} (x + y^2)dx + (x + y)dy$ through the curve $x = y^2 + 2$ 3

<u>Question 3</u> (14 marks)

(a)If $f(z) = z + e^z$. Show that u(x, y) , v(x, y) satisfy the Riemman's equations. 2

(b)If $v = x^3 - 3xy^2$. Find its conjugate u and write $f(z) = u + iv$. 2

(c)Determine and sketch the image of the region G : $0 \leq x \leq \pi$, $0 \leq y \leq 2$ 4

under the function $f(z) = \sin z$.

(d)If C is the circle $|z - 1| = 3$. Find the integrals: 6

$(i) \oint_C \frac{z + \sin z}{z^2 + 15} dz \qquad (ii) \oint_C \frac{\sin z}{(z-\pi)^2} dz \qquad (iii) \oint_C \frac{2^z}{(z+1)(z-3)} dz$

<u>Question 4</u> (6 marks)

(a)Write the Fourier series of $f(x) = x, \; -\pi \leq x \leq \pi$, $f(x + 2\pi) = f(x)$.

(b)Write the Fourier cosine of the function $f(x) = x + 1$, x in $[0,1]$, $f(x + 2) = f(x)$

Good Luck   *Dr. Mohamed Eid*