Credit Hours Programs Program of Elec. Eng. and Control Duration: 2 hours Date : January 11, 2020	Faculty of Eng. – Shoubra	Final Exam Course: Mathematics 4 Code: EMP 202 Group: 3181

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

Question 1 (12 marks) 12

Solve the following equations :

(a) $(x - \sin y)dx - x\cos y\, dy = 0$

(b) $y` + \frac{2}{x+1}y = x$

(c) $y`` - 4y` - 5y = e^{4x} + e^{-2x}$

(d) $y`` + y = 4 + 3\cos 2x$

(e) $y`` - 2y` + y = x + x^3$

(f) $y`` + y = \csc x$

Question 2 (8 marks)

(a)Find the L.T of : (i) $f(t) = 3 - e^{-2t} + \sinh 2t$ (ii) $f(t) = t.\sin t + e^{2t}.\cos t$ 2

(b)Find the inverse L.T of : (i) $F(s) = \frac{1}{s} + \frac{s+3}{s^2+4}$ (ii) $F(s) = \frac{2}{(s-3)^3} + \frac{s}{s^2+4}e^{-2s}$ 2

(c)By L.T, solve the equation : $y`` - 4y` + 4y = e^{2t}$, $y(0) = 0$ , $y`(0) = 1$. 4

Question 3 (10 marks)

(a)Find the one root for the equation $x^3 - 5x^2 + 2 = 0$. Calculate the error at each iteration.

(b)The point **(5, −11), (7, 3), (9, 1), (11, 31)** on the curve of the function $f(x)$ Find the Newton interpolation polynomial which interpolate $f(x)$ at the given points hence find $f(5.5)$.

Question 4 (10 marks)

(a)Apply Trapezoidal rule to find $\int_0^1 \sqrt{1+x^2}\, dx$ consider h = 0.1

(b)Use Euler Method to solve the differential equation in the interval [0, 1]

consider h = 0.2 , $y' = \frac{1}{2}(x^2 + y^2)$, $0 < x < 1$, $y(0) = 1$

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

Credit Hours Programs Program of Industrial Engineering Duration: 2 hours Date : January 11, 2020	Faculty of Eng. – Shoubra	Final Exam Course: Mathematics 4 Code: EMP 202 Group: 3342

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

Question 1 (12 marks) — 12

Solve the following equations :

(a) $(y + \sin x)dx + (x - \cos y)dy = 0$

(b) $y` - \frac{1}{x}y = x^4$

(c) $y`` - 2y` - 3y = e^{2x} + e^{-3x}$

(d) $y`` - 4y = 1 - 3\cos 2x$

(e) $y`` - y = x^4 - x$

(f) $y`` + y = \sec x$

Question 2 (8 marks)

(a)Find the L.T of : (i) $f(t) = e^t + \cos 2t$ (ii) $f(t) = \sinh t + e^{3t}.\cos t$ — 2

(b)Find the inverse L.T of : (i) $F(s) = \frac{2}{s} + \frac{s}{s^2+4}$ (ii) $F(s) = \frac{1}{s-3} - \frac{1}{s^2+1}$ — 2

(c)By L.T, solve the equation : $y`` - 6y` + 9y = e^{3t}$, $y(0) = 0$ , $y`(0) = 1$. — 4

Question 3 (10 marks)

(a) Using the bisection method, find a root to the equation : $2^x + x - 4 = 0$ — 4

in the interval [1, 2], number of iterations is 3.

(b)Find the integrals : (i) $\int_0^3 \frac{\sqrt{x}}{x-2}\,dx$ (ii) $\int_2^\infty \frac{x}{1+x^3}\,dx$ — 4

(c)Find $f`(2)$ where $f(x) = \begin{cases} x^3 + 1, & x > 2 \\ x^2 + 5, & x \le 2 \end{cases}$ and $h = 0.1$ — 2

Question 4 (10 marks)

(a)Find the line $y = a + bx$ that fits the data: (1, 4), (2, 3), (4, 7), (5, 10), (6, 15) — 5

Also, find $\bar{x}$, $\bar{y}$, σ_x, σ_y and the correlation coefficient r.

(b)If x is random variable with pdf $f(x) = \frac{1}{21}(2x^2 + 1)$, $0 \le x \le 3$. — 5

Find μ, $P(x \le 2)$, $P(x > 1)$.

Good Luck *Dr. Mohamed Eid*