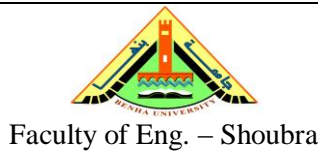


Credit Hours Programs
 Program of Elec. Eng. and Control
 Duration: 2 hours
 Date : January 11, 2020



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)

Solve the following equations :

12

(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) $f(t) = t \cdot \sin t + e^{2t} \cdot \cos t$

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

Question 1 (12 marks)

Solve the following equations :

12

- | | |
|---|--------------------------------|
| (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) $f(t) = \sinh t + e^{3t} \cdot \cos t$ | 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 : $2^x + x - 4 = 0$
in the interval $[1, 2]$, number of iterations is 3. | 4 | |
| (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 $f(x) = \begin{cases} x^3 + 1, & x > 2 \\ x^2 + 5, & x \leq 2 \end{cases}$ 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)
Also, find \bar{x} , \bar{y} , σ_x , σ_y and the correlation coefficient r . | 5 |
| (b) If x is random variable with pdf $f(x) = \frac{1}{21}(2x^2 + 1)$, $0 \leq x \leq 3$.
Find μ , $P(x \leq 2)$, $P(x > 1)$. | 5 |

Good Luck

Dr. Mohamed Eid