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Electrical Electronics Engineering

300 Level

ENG 382

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

$$f(x) = e^{-0.5x} (4-x) - 2$$

$$f'(x) = u = e^{-0.5x} \quad v = 4-x$$

$$f'(x) = \frac{dy}{dx} = v \frac{du}{dx} + u \frac{dv}{dx}$$

$$f'(x) = (4-x)(-0.5e^{-0.5x}) + e^{-0.5x}(-1)$$
$$f'(x) = 0.5e^{-0.5x}(x-4) - e^{-0.5x}$$

$$x_{n+1} = x_n - \frac{e^{-0.5x}(4-x) - 2}{0.5e^{-0.5x}(x-4) - e^{-0.5x}}$$

i	x	E _n
0	0.5	0
1	0.838890606	40.39747299
2	0.8849559509	5.205386019
3	0.8857086071	0.68777447061
4	0.885708802	

$$x_{0+1} = \frac{0.5 - e^{-0.5(0.5)}(4-0.5) - 2}{e^{-0.5(0.5)}(0.5-4) - e^{-0.5 \times 0.5}}$$

$$= 0.838890606$$

$$Error = \left| \frac{X_{n+1} - X_n}{X_{n+1}} \right| \times 100\%$$

$$= \left| \frac{0.838890606 - 0.5}{0.838890606} \right| \times 100$$

$$= 40.39747299$$

$$X_2 = 0.838890606 - \frac{e^{-0.5(0.838890606)} (4 - 0.838890606) - 2}{0.5e^{-0.5(0.838890606)} (0.838890606 - 4) - e^{-0.5(0.838890606)}}$$

$$= 0.8849559809$$

$$Error = \left| \frac{0.8849559809 - 0.838890606}{0.8849559809} \right| \times 100$$

$$= 5.205386019$$

$$X_3 = 0.8849559809 - \frac{e^{-0.5(0.8849559809)} (4 - 0.8849559809) - 2}{0.5e^{-0.5(0.8849559809)} (0.8849559809 - 4) - e^{-0.5(0.8849559809)}}$$

$$= 0.8857086071$$

$$Error = \left| \frac{0.8857086071 - 0.8849559809}{0.8857086071} \right| \times 100$$

$$= 0.8497447061$$

$$X_4 = 0.8857086071 - \frac{e^{-0.5(0.8857086071)} (4 - 0.8857086071) - 2}{0.5 e^{-0.5(0.8857086071)} (0.8857086071 - 4) - e^{0.5(0.8857086071)}}$$

$$= 0.885708802$$

$$E_a = \left| \frac{0.885708802 - 0.8857086071}{0.885708802} \right| \times 100$$

$$= 2.200497495 \times 10^{-5}$$

$$X_5 = 0.885708802 - \frac{e^{-0.5(0.885708802)} (4 - 0.885708802) - 2}{0.5 e^{-0.5(0.885708802)} (0.885708802 - 4) - e^{0.5(0.885708802)}}$$

$$= 0.885708802$$

$$E_a = \left| \frac{0.885708802 - 0.885708802}{0.885708802} \right| \times 100$$

$$= 0$$