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1809808

by Daniel Mateo

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Further Engineering Mathematics SGEE 5001

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Section A

a)

x	f	xf	$f(x-\bar{x})^2$
3	3	9	28.08
4	17	68	72.14
5	29	145	32.58
6	46	276	0.18
7	33	231	29.16
8	18	144	67.74
9	4	36	34.57
$\Sigma = 150$		$\Sigma = 909$	$\Sigma = 264.45$

$$\bar{x} = \frac{909}{150}$$

$$\bar{x} = 6.06$$

$$\sigma = \sqrt{\frac{264.45}{150}} = 1.76 \text{ correct}$$

6/7

b)

i $\sigma = 40$ $\bar{x} = 200$

$$z = \frac{x - \mu}{\sigma} \therefore \frac{245 - 200}{40} = 1.125$$

3

$$0 \rightarrow 1.125 = 0.3944$$

$$P(245) = 0.3944 - 0.5$$

2

$$P(245) = 0.1056 = 10.56\%$$

ii

0.1 smaller than X

$$P(x < 0.1) = 0.2533 \quad 0.1 - 0.5 = -0.4$$

$$\cancel{0.4 = Z = 1.2816} \quad \therefore \quad \cancel{1.2816 = X - \frac{200}{40}}$$

$$X = (1.2816 \times 80) - 200 = 97.47$$

take ~~97.47~~ - 100

~~0.1 + 0.5~~

$$0.1 \quad Z = 0.2533$$

$$\text{re-arrange} \quad 0.2533 = \frac{X - 200}{40}$$

$$= (0.253 \times 40) - 200 = \underline{189.88} \quad x$$

section A total
= 11/25



Section B

$$1) \frac{dy}{dt} + 4y = 10$$

$$y(0) = 3$$

$$(s\bar{y} - y_0) + 6\bar{y} = \frac{10}{s}$$

wrong value of 6

-1

$$\text{Since } y(0) = 3$$

$$(s\bar{y} - 3) + 6\bar{y} = \frac{10}{s}$$

$$s\bar{y} + 6\bar{y} = \frac{10}{s} + 3$$

$$\bar{y}(s+6) = \frac{10+3s}{s}$$

$$\bar{y}(s+6) = \frac{10+3s}{s}$$

$$\bar{y} = \frac{10+3s}{s(s+6)} = \frac{A}{s} + \frac{B}{s+6}$$

$$10+3s = A(s+6) + B(s)$$

$$\text{if } s = -6$$

$$10+3s = A(0) + B(-6)$$

$$10 - 18 = -6B$$

$$-8 = -6B$$

$$\frac{-8}{-6} = B = \frac{4}{3}$$

-1

$$0 = 0$$

$$10 - 0 = 6A$$

$$\frac{10}{6} = A$$

$$A = 5/3$$

-1

$$g = \frac{5/3}{s} + \frac{4/3}{s+6}$$

$$y = \int^{-1} \left\{ \frac{1.667}{s} + \frac{1.333}{s+6} \right\}$$

$$y = \cancel{1.667} 1.667 + 1.33e^{-3}$$

should be -

total

=

18/2

5



2) $R=30\Omega$ $L=0.6H$ $E=30V$ $I(0)=0$.

$RL=$

$$L \frac{di}{dt} + RI = E$$

$$0.6 \frac{di}{dt} + 30I = 30$$

wrong value

2

$$\div 0.6$$

$$\frac{di}{dt} + 100I = 50$$

1

$$\int \frac{di}{dt} = \int 100 dt = 100t$$

1

$$i = e^{100t}$$

1

$$Ie^{100t} = \int e^{100t} \cdot 50 dt$$

$$= 50e^{100t} dt$$

$$= \frac{50}{100} e^{100t} + C$$

$$= 0.5e^{100t} + C$$

2

when $I=0$ $t=0$

$$Ie^{100t} = 0.5e^{100(0)} + C$$

$$C = -0.5$$

1

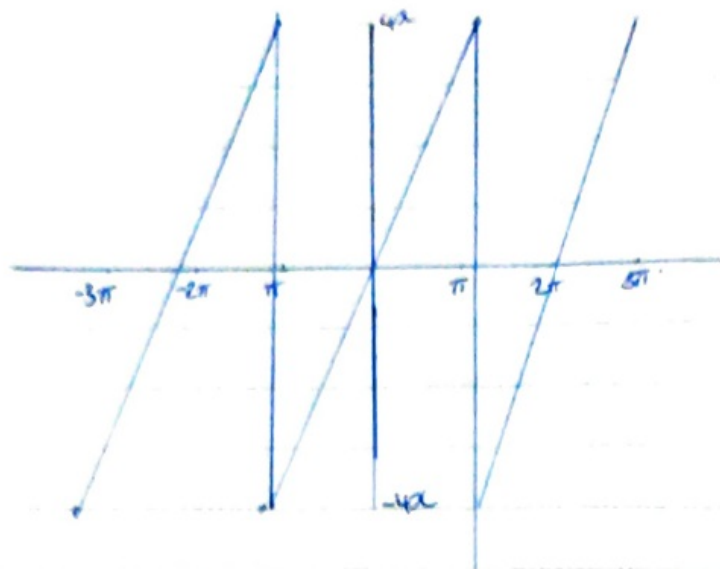
$$\therefore Ie^{100t} = 0.5e^{-100t} - 0.5$$

should be +ve

1

total = 9/25

3



$$f(\pi) = 4\pi$$

$$f(0) = 0$$

$$f(-\pi) = -4\pi$$

This is odd so is not symmetrical about y axis.

$$a_n = 0$$

$$a_0 = 0$$

$$b_n = \frac{2}{\pi} \int_0^{\pi} 4x \sin nx \, dx$$

$$\text{let } u = 4x \quad \frac{dv}{dx} \sin nx$$

$$\frac{du}{dx} = 4$$

$$v = \frac{-1}{n} \cos x$$

$$\int 4x \sin nx \, dx = 4x \left(\frac{-1}{n} \cos x \right) - \int \frac{-1}{n} \cos x (4) \, dx$$

$$= -\frac{4x}{n} \cos x + \int \frac{4}{n} \cos x \, dx$$

$$= -\frac{4x}{n} \cos x + \frac{4}{n^2} \sin nx$$

$$\therefore b_n = \left[-\frac{4x \cos x}{n} + \frac{4}{n^2} \sin nx \right]_0^{\pi}$$

$$b_n = \left[\frac{-4\pi}{n} + \frac{4}{n^2} \sin(n\pi) \right] - \left[\frac{-4(0)}{n} \cos$$

$$b_n = \frac{2}{\pi} \left[\frac{-4\pi}{n} \cos(n\pi) + \frac{4}{n^2} \sin(n\pi) \right] - \left[\frac{-4(0)}{n} \cos 0 + \frac{4}{n^2} \sin(0) \right]$$

$$b_n = \frac{-8\pi \cos n\pi}{n\pi}$$

$$= \frac{-8}{n} \cos(n\pi)$$

correct to here

$$n=1 \quad \frac{-8\pi \cos(1\pi)}{1\pi} = 8\pi$$

x

$$n=2 \quad \frac{-8\pi \cos(2\pi)}{2\pi} = -4\pi$$

$$n=3 \quad \frac{-8\pi \cos(3\pi)}{3} = \frac{8}{3}\pi$$

$$n=4 \quad \frac{-8\pi \cos(4\pi)}{4} = -2\pi$$

$$f(x) = \cancel{8\pi} \frac{1}{2} a_0 + \sum_{n=1}^{\infty} (a_n \cos nx + b_n \sin nx)$$

$$f(x) = b_n \sin nx$$

$$f(x) = 8\pi \sin(x) - 4\pi \sin(2x) + \frac{8}{3}\pi \sin(3x) - 2\pi \sin(4x) \dots$$

x

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GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

59/100

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PAGE 2

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Text Comment. 6/7

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PAGE 3

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PAGE 4

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PAGE 5

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PAGE 6

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PAGE 8

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