

# Dion Gealy Maths exam

*by Alun Gealy*

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|----------------|---------------------------------------------------------------------|-----------------|------|
| FILE           | 16480_ALUN_GEALY_DION_GEALY_MATHS_EXAM_177947_900899395.PDF (5.21M) |                 |      |
| TIME SUBMITTED | 06-MAY-2020 12:54PM (UTC+0100)                                      | WORD COUNT      | 515  |
| SUBMISSION ID  | 126433417                                                           | CHARACTER COUNT | 2199 |

## Section A.

a)

| x              | F  | xF  | $F(x - \bar{x})^2$ |
|----------------|----|-----|--------------------|
| 3              | 3  | 9   | 26.46              |
| 4              | 12 | 48  | 46.57              |
| 5              | 21 | 105 | 19.76              |
| 6              | 28 | 168 | 0.02               |
| 7              | 23 | 161 | 24.40              |
| 8              | 11 | 88  | 45.33              |
| 9              | 2  | 18  | 18.36              |
| $\Sigma = 100$ |    |     | $\Sigma = 180.9$   |

$$\bar{x} = \frac{597}{100} = 5.97$$

$$\sigma = \sqrt{\frac{180.9}{100}} = 1.34$$

-1 for accuracy

b) i)  $P(x=r) = \frac{e^{-\lambda} \lambda^r}{r!}$

$$\lambda = 1.9$$

$$\therefore P(x=r) = \frac{e^{-1.9} 1.9^r}{r!}$$

$$P(x=3) = \frac{e^{-1.9} 1.9^3}{3!} = \cancel{0.2435} \underline{0.170}$$

ii) More than 1 =  $P(2) + P(3) + P(4) \dots$

$$\therefore 1 - (P(0) + P(1))$$

$$= 1 - (e^{-1.9} + e^{-1.9} 1.9) = 1 - 1.9e^{-1.9} = 0.149$$

section  
n A  
total =  
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-2 for accuracy

$$P(X=0) = \frac{e^{-1.9} 1.9^0}{0!}$$

$$P(X=1) = \frac{e^{-1.9} 1.9^1}{1!} = \frac{1.9 e^{-1.9}}{1} = 0.283$$

$$\therefore P(X>1) = 1 - (0.149 + 0.283) = 0.568$$

$$2) R = 40 \Omega \quad L = 0.5 H$$

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

$$0.5 \frac{dI}{dt} + 40 I = 30$$

÷ All by 0.5

$$\frac{dI}{dt} + 80 I = 60$$

$$\int \frac{dI}{I} = \int 80 dt = 80t$$

$$\ln I = e^{80t}$$

$$I_{80t} = \int e^{80t} \cdot 60 dt$$

$$= \int 60 e^{80t} dt$$

$$I_{80t} = \frac{60}{80} e^{80t} + C$$

$$I_{80t} = \frac{3}{4} e^{80t} + C$$

$$\text{When } I = 0 \quad t = 0$$

$$0 = \frac{3}{4} e^0 + C$$

$$C = -\frac{3}{4} = -0.75$$

$$I_{80t} = \frac{3}{4} e^{80t} - \frac{3}{4}$$

$$\text{or } I = \frac{3}{4} (e^{80t} - 1)$$



$$\frac{dy}{dx} = 6 \quad v = \frac{1}{n} \sin nx$$

$$\frac{dv}{dx} = \cos nx$$

$$\text{let } v = 6x$$

$$\int_{\pi}^{\frac{\pi}{2}} 6x \cos nx \, dx$$

$$a_n = \frac{\pi}{2} \int_{\pi}^{\frac{\pi}{2}} f(x) \cos nx \, dx$$

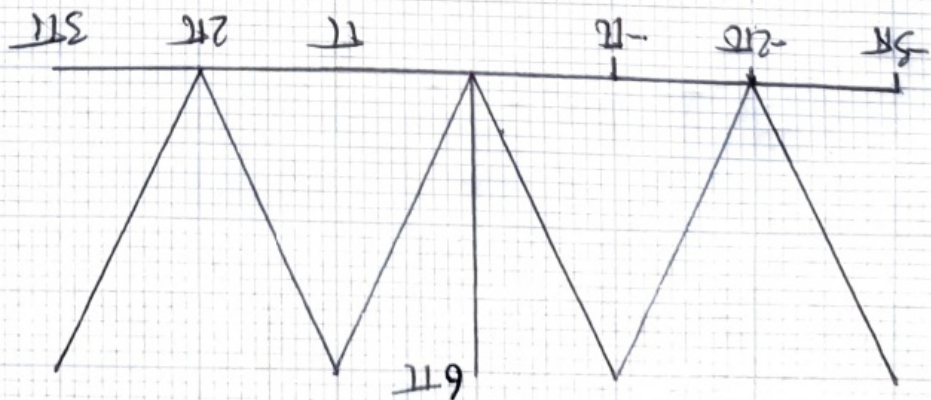
$$a_0 = 6\pi$$

$$= \frac{\pi}{2} \left[ \frac{6x^2}{2} - 0 \right]$$

$$= \frac{\pi}{2} \left[ \frac{6x^2}{2} \right]_{\pi}^{\frac{\pi}{2}}$$

$$a_0 = \frac{\pi}{2} \int_{\pi}^{\frac{\pi}{2}} 6x \, dx$$

Even function  $\therefore b_n = 0$



$$f(x) = 6$$

Section B.

3).  $f(x) = -6x$   $(-\pi < x < \pi)$

$$\int 6x \cos nx = (6x)(\frac{1}{n} \sin nx) - \int \frac{1}{n} \sin nx \cdot 6 dx$$

$$= \frac{6x}{n} \sin nx + \frac{1}{n^2} \cos nx$$

$$\therefore a_n = \frac{1}{n^2} \left[ \frac{6x}{n} \sin nx + \frac{1}{n^2} \cos nx \right]_0^\pi$$

$$= \frac{1}{n^2} \left[ \frac{6\pi}{n} \sin(n\pi) + \frac{1}{n^2} \cos(n\pi) \right] - \left[ \frac{6 \cdot 0}{n} \sin(0) + \frac{1}{n^2} \cos(0) \right]$$

$$\frac{1}{n^2} \left[ \frac{6\pi}{n} \sin(n\pi) + \frac{1}{n^2} \cos(n\pi) \right]$$

$$= \frac{1}{n^2} \left[ \frac{6\pi}{n} \cos(n\pi) \right] - \frac{1}{n^2} \left[ \frac{6 \cdot 0}{n} \right]$$

$$a_n = \frac{1}{n^2} \left[ \cos(n\pi) - 1 \right]$$

$$\text{If } n=1 \quad a_1 = \frac{1}{1^2} \left[ \cos \pi - 1 \right] = -\frac{1}{1^2}$$

$$n=2 \quad a_2 = \frac{1}{2^2} \left[ \cos 2\pi - 1 \right] = 0$$

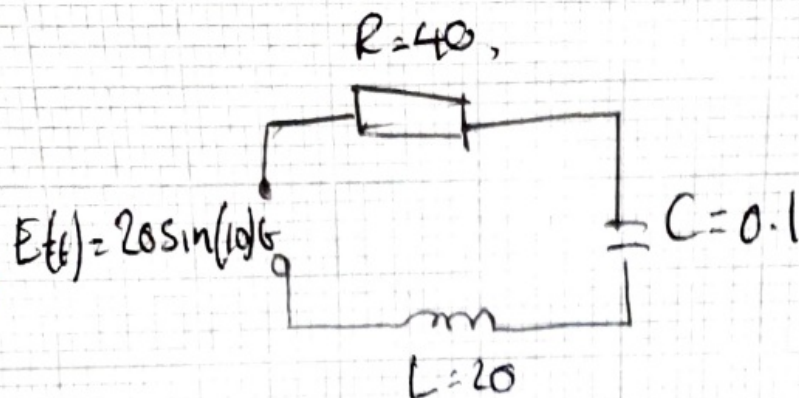
$$n=3 \quad a_3 = \frac{1}{3^2} \left[ \cos 3\pi - 1 \right] = -\frac{1}{3^2}$$

$$n=4 \quad a_4 = 0$$

$$\therefore f(x) = \frac{1}{2} (6\pi) - \frac{1}{24} (\cos x - \frac{1}{24} \cos 3x - \frac{1}{24} \cos 5x - \dots)$$

By Parts

4.



$$1'' + 21' + 0.5I = 10 \cos 10t$$

~~$$E(t) = E_L + E_R + E_C$$~~

~~$$E(t) = L \frac{dI}{dt} + RI + \frac{1}{C} \int I dt$$~~

~~Differentiate w.r.t~~

• C.F.  $K^2 + 21K + 0.5 = 0$ . misread the writing above, should be 2k

$$m = \frac{-21 \pm \sqrt{21^2 - 4(1)(0.5)}}{2(1)}$$

$$m = \frac{-21 \pm \sqrt{439}}{2} = -0.023 \text{ or } -20.976.$$

Round up to -0.02 and 21.

\* Real and different.

$$C.F. = I_c = A e^{-0.02t} + B e^{-21t}$$

2

•  $y = y_c + y_p$ .

trial solution

$$I = C \sin 10t + D \cos 10t$$

$$\frac{dI}{dt} = 10C \cos 10t - 10D \sin 10t$$

$$10C \cos 10t - 10D \sin 10t = 10 \cos 10t$$

$$\frac{d^2 I}{dt^2} = -1000 \sin 10t - 1000 \cos 10t$$

Sub into D.E.

$$L \frac{d^2 I}{dt^2} + R \frac{dI}{dt} + \frac{1}{C} I = 20 \sin(10)t$$

incorrect RHS

answering wrong question from  
here

$$I_2 = 20(-100C \sin 10t - 100D \cos 10t) +$$

$$\cancel{40(10C \sin 10t + 10D \cos 10t)} + 10(C \sin 10t + D \cos 10t) = 20 \sin 10t$$

$$= -200C \sin 10t - 200D \cos 10t + 40C \sin 10t - 400D \sin 10t + 10C \sin 10t + 10D \cos 10t$$
$$= 20 \sin 10t$$

Compare terms of  $\sin 10t$ .

$$\bullet \quad -200C - 400D + 10C = 20$$

$$\cancel{= 190C - 400D = 20}$$

$$\cancel{-190C = 400D + 20}$$

Compare terms of  $\cos 10t$ .

$$-200D + 400C + 10D = 0$$

$$-190D + 400C = 0$$

$$190D = 400C$$

$$\bullet \quad D = \frac{400C}{190} = -2.105C$$

Compare terms of  $\sin 10t$ .

$$-200C - 400D + 10C = 20$$

$$-190C - 400D = 20$$

$$\cancel{-190C = 20 + 400D}$$
$$\cancel{-190C = 820}$$

$$\text{where } D = -2.105C$$

$$\begin{array}{r} \cancel{1872} \\ \cancel{190} \end{array}$$

$$-190C - 400(-2.105C) = 20$$

$$-190C + 842C = 20$$

$$652C = 20$$

$$C = \frac{20}{652} = 0.031$$

$$\therefore D = -2.105(0.031) = -0.065$$

$$\text{So } IP = 0.031 \sin 10t + 0.065 \cos 10t$$

$$\text{G.S } I = Ae^{-0.02t} + Be^{-21t} + 0.031 \sin 10t + 0.065 \cos 10t$$

$$\text{Since } I(0) = 0.$$

$$0 = Ae^0 + Be^0 + 0.031 \sin 0 + 0.065 \cos 0.$$

$$0 = A + B - 0.065 \quad \text{--- (1)}$$

$$\frac{dI}{dt} = -0.02 Ae^{-0.02t} - 21 Be^{-21t} + 0.31 \cos 10t + 0.65 \sin 10t$$

$$\text{Since } I'(0) = 0.$$

$$0 = -0.02Ae^0 - 21Be^0 + 0.31 \cos 0 + 0.65 \sin 0$$

$$0 = -0.02A - 21B + 0.31 \quad \text{--- (2)}$$

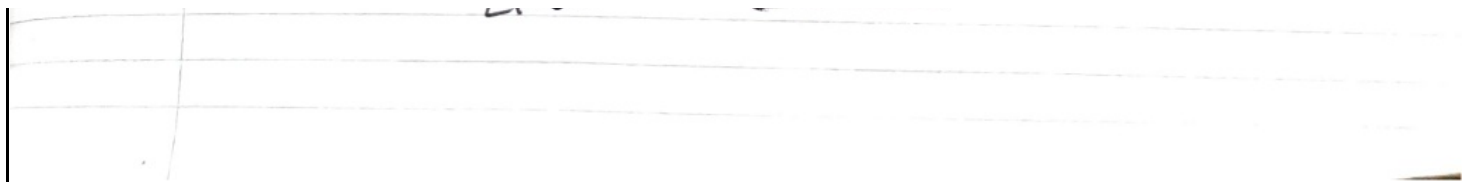
$$-0.02 = -0.02A - 0.02B - 0.0013$$

$$0 = -0.02A - 21B + 0.31$$

$$-0.02 = -21.02B + 0.309$$

$$21.02B = 0.309 + 0.02$$

$$B = \frac{0.329}{21.02} = 0.016$$



$$\therefore 0 = -0.02A - \overset{21}{\cancel{0.02}}(0.016) + 0.31.$$

$$0.02A = 21(0.016) + 0.31$$

$$0.02A = 0.649$$

$$A = \frac{0.649}{0.02} = 32.3.$$

$$\therefore \underline{I} = 32.3e^{-0.02t} + 0.016e^{-21t} + 0.031\sin 10t - 0.065\cos 10t.$$

Total

=

2/25

[illegible]

# Dion Gealy Maths exam

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## GRADEMARK REPORT

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FINAL GRADE

GENERAL COMMENTS

73/100

**Instructor**

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PAGE 1

**Text Comment.** -1 for accuracy

**Text Comment.** section A total = 22/25

**Text Comment.** -2 for accuracy

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PAGE 2

**Text Comment.** 25/25

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PAGE 3

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PAGE 4

**Text Comment.** -1

**Text Comment.** 24/25

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PAGE 5

**Text Comment.** misread the writing above, should be 2k

**Text Comment.** 2

**Text Comment.** incorrect RHS

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PAGE 6

**Text Comment.** answering wrong question from here

**Text Comment.** Total = 2/25