

12 Pages

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

(see note 2 below)

SURNAME:

KENNY

FORENAME(S):

Sam

1	Student Number	1603336/1
2	Title of Examination Paper	electrical Principals Theory
3	Module Code	M2X0003
4	Date and Time of Examination	4 May 2018
5	Examination Venue	Main Hall
6	Seat Number	4
7	Number of Answer Books handed in	1

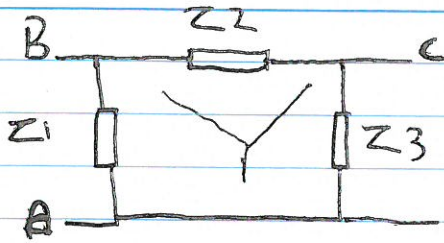
List the numbers of the questions you have attempted	Office Use
Q1	3
Q2	7
Q3	1
Office Use	11 %

1) A) i)

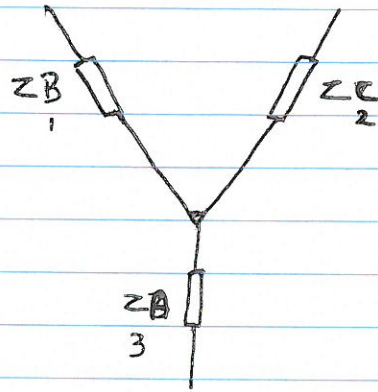
$$RL = \frac{30 \times 150}{30 \times 150} \times 360$$

0

1) B)



$$\begin{aligned} Z_1 &= 5 + j15 \Omega \\ Z_2 &= 15 - j5 \Omega \\ Z_3 &= 10 + j30 \Omega \end{aligned}$$



(2c)

$$Z_1 = \frac{Z_B \times Z_C}{Z_A + Z_B + Z_C} = \frac{(5 + j15) \times (15 - j5)}{(10 + j30) + (5 + j15) + (15 - j5)}$$

$$= \frac{20 + j10}{15 + 20 + j45 - 20j} = \frac{20 + j10}{35 - 25j} = 3 \Omega$$

$$Z_2 = \frac{Z_A \times Z_C}{Z_A + Z_B + Z_C} = \frac{(10 + j30) \times (15 - j5)}{(10 + j30) + (5 + j15) + (15 - j5)}$$

$$= 0 \Omega = \frac{25 - 25j}{15 + 20 + j45 - 20j} = \frac{25 - 25j}{35 - j25}$$

$$Z_3 = \frac{Z_A \times Z_B}{Z_A + Z_B + Z_C} = \frac{(10 + j30) \times (5 + j15)}{(10 + j30) + (5 + j15) + (15 - j5)}$$

$$= \frac{15 + j45}{15 + 20 + j45 - j20} = \frac{15 + j45}{35 - 25j} = 6 \Omega$$

Q2

$$f(x) = \begin{cases} 0 & \text{if } -\pi \leq x < 0 \\ 1 & \text{if } 0 \leq x < \pi \end{cases} \quad \text{and } f(x+2\pi) = f(x)$$

$$f(x) = a_0 + \sum_{N=1}^{\infty} [a_N \cos Nx + b_N \sin Nx]$$

$$a_0 = \frac{1}{2\pi} \int_{-\pi}^{\pi} f(x) dx \quad \checkmark$$

$$a_0 = \frac{1}{2\pi} \int_{-\pi}^{\pi} f(x) dx + \frac{1}{2\pi} \int_0^{\pi} f(x) dx \quad \checkmark$$

$$= \frac{1}{2\pi} \int_0^{2\pi} 1 dx - \frac{1}{2\pi} \int_{-\pi}^0 0 dx = \frac{1}{2\pi} \int_0^{2\pi} 1 dx = \frac{1}{2\pi} [x]_0^{2\pi} = \frac{1}{2\pi} (2\pi - 0) = 1$$

$$a_n = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \cos nx \, dx$$

$$a_n = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \cos nx \, dx \neq \int_{-\pi}^{\pi} f(x) \cos nx \, dx$$

$$a_n = \frac{1}{\pi} \int_0^{2\pi} f(x) \cos nx \, dx + \frac{1}{\pi} \int_{-\pi}^0 f(x) \cos nx \, dx$$

$$b_n = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \sin nx \, dx \quad \checkmark$$

$$b_n = \frac{1}{\pi} \int_{-\pi}^0 f(x) \sin nx \, dx + \frac{1}{\pi} \int_0^{\pi} f(x) \sin nx \, dx$$

$$4e^t + 5$$

Q3) A) i)

$$e^{4t} + 5 = \frac{1}{5-4} = \frac{1}{1} = 1$$

ii)

$$\cos(2t) + 7\sin(2t)$$

$$= \frac{2as^2}{(s^2 + a^2)^2} = \frac{2(2t)^2}{(s^2 + 7^2)^2}$$

$$= 0.99 + 0.244(2t) = \frac{2as^2}{(s^2 + a^2)^2} = +$$

~~WAV~~

$$\frac{2(2t)^2}{(0.99^2 + 0.244^2)^2} = \underline{3.7}$$

$$\text{iii) } (t^2 + 4t + 2)e^{3t}$$

$$= (2t + 4t + 2) 3^{et}$$

$$= (6t + 2) 3^{et}$$

$$= 6t^2 + 3e \quad \times$$

$$\text{iv) } 6e^{5t} \cos(2t) - e^{7t}$$

$$= 6^{et} 5\cos(2t) - 7^{et}$$

$$= 6^{et} 4.99t - 7^{et}$$

$$= et - 4.99t \quad +$$

2) B)

$$5 \frac{dx}{dt} + 3x = 4 \quad \text{with } x=0 \text{ at } t=0$$

0
✓