



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE COMMUNICATION-ELECTRONICS N5

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This marking guideline consists of 9 pages.

QUESTION 1: AC NETWORKS

1.1 1.1.1
$$C = \frac{1}{(2\pi f)^2 L}$$

$$= \frac{1}{(2\pi \times 45 \times 10^6)^2 \times 100 \times 10^{-6}}$$

$$= 0,125 \text{ pF} \checkmark \checkmark$$
 (3)

1.1.2
$$Z_D = \frac{L}{CR}$$

$$= \frac{100 \times 10^{-6}}{0,125 \times 10^{-12} \times 12}$$

$$= 66,667 \text{ M}\Omega \checkmark \checkmark$$
 (2)

1.1.3
$$C = \frac{1}{(2\pi f)^2 L}$$

$$= \frac{1}{(2\pi \times 48 \times 10^6)^2 \times 100 \times 10^{-6}}$$

$$= 0,11 \text{ pF} \checkmark \checkmark$$

$$C_T = 0,125 \times 10^{-12} - 0,11 \times 10^{-12}$$

$$= 0,015 \text{ pF} \checkmark$$

Thus subtract 0,015 pF \checkmark (4)

1.1.4
$$Q_1 = \frac{1}{R} \sqrt{\frac{L}{C}}$$

$$= \frac{1}{12} \sqrt{\frac{100 \times 10^{-6}}{0,125 \times 10^{-12}}}$$

$$= 2357,023 \checkmark \checkmark$$

$$Q_2 = \frac{1}{R} \sqrt{\frac{L}{C}}$$

$$= \frac{1}{12} \sqrt{\frac{100 \times 10^{-6}}{0,11 \times 10^{-12}}}$$

$$= 2512,595 \checkmark \checkmark$$
 (4)

$$1.2 \quad Q = \frac{2\pi(\text{maximum energy stored during one cycle})}{\text{energy dissipated during one cycle}} \checkmark$$

$$\text{But max. energy stored by } C = \frac{1}{2} C (\sqrt{2} V)^2 \checkmark \dots \text{ a capacitor store voltage} \\ = CV^2 \dots \text{ but } V = I \cdot X_c$$

Substituting:

$$= C(I \cdot X_c)^2 \dots \dots \text{ but } X_c = \frac{1}{\omega C} \checkmark$$

$$= C \left(I \cdot \frac{1}{\omega C} \right)^2$$

$$= \frac{I^2}{\omega^2 C} \checkmark$$

$$\text{Energy dissipated per cycle: } t = \frac{1}{f} \text{ sec} \\ = \frac{I^2 R}{F} \checkmark$$

Substituting:

$$Q = \frac{2\pi \left(\frac{I^2}{\omega^2 C} \right)}{\frac{I^2 R}{F}} \checkmark$$

$$= \frac{2\pi I^2}{\omega^2 C} \times \frac{F}{I^2 R} \checkmark \dots \text{ but } \omega = 2\pi F$$

$$= \frac{2\pi F}{(2\pi F)^2 C} \times \frac{1}{R} \checkmark$$

$$= \frac{1}{2\pi F C} \times \frac{1}{R} \checkmark \dots \text{ but } \frac{1}{2\pi F C} = X_c$$

Substituting:

$$= X_c \times \frac{1}{R}$$

$$Q = \frac{X_c}{R} \checkmark$$

(10)
[23]