



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

COMMUNICATION-ELECTRONICS N5

28 MARCH 2019

This marking guideline consists of 8 pages.

QUESTION 1

1.1 The ability of a tuned circuit to discriminate against frequencies other than its resonance frequency (3)

1.2 $Q = 100$; $R = 100 \Omega$; $E = 10 \text{ mV}$; $f = 455 \text{ kHz}$; $I = 0,1 \text{ A}$

1.2.1 $V_L = EQ$
 $V_L = 10 \text{ mV} \times 100$
 $V_L = 1 \text{ V}$

$V_C = V_L = 1 \text{ V}$ (5)

1.2.2 $\frac{X_L}{R} = 100$
 $X_L = 100 \times R$
 $L = \frac{100(100\Omega)}{2\pi f}$
 $L = \frac{10\,000 \Omega}{2 \times \pi(455 \times 10^3 \text{ Hz})}$
 $L = 3,5 \mu\text{H}$ (3)

1.3 1.3.1 $Z_{RL} = R + jX_L$
 $Z_{RL} = 3 + j4$
 $Z_{RL} = 5\Omega \angle 25.32^\circ$

$Z_C = 0 - jX_C$
 $Z_C = 0 - j3$
 $Z_C = 3\Omega \angle -90^\circ$

$I_{LR} = \left(\frac{Z_C}{Z_{LR} + Z_C} \right) I_S$
 $I_{LR} = \left(\frac{3\Omega \angle -90^\circ}{3 + j4 - j3} \right) 50 \text{ A} \angle 30^\circ$
 $I_{LR} = 75 \text{ A} \angle -41,565^\circ$ (6)

$$1.3.2 \quad I_C = \left(\frac{Z_{LR}}{Z_{LR} + Z_C} \right) I_S$$

$$I_C = \left(\frac{5\Omega \angle 25.32^\circ}{3 + j4 - j3} \right) 50A \angle 30^\circ$$

$$I_C = \left(\frac{100V \angle 55.32^\circ}{2\Omega \angle 18.433^\circ} \right)$$

$$I_C = 50A \angle 36.89^\circ$$

(5)
[22]**QUESTION 2**

$$2.1 \quad Q_P = \frac{X_{L_P}}{R_1 + Ri}, \quad f_o = \frac{1}{2 \times \pi \sqrt{LC}} = \frac{1}{2 \times \pi \sqrt{(120 \times 10^{-6} H)(500 \times 10^{-12} F)}} = 649,747 kHz$$

$$Q_P = \frac{2 \times \pi \times f \times L_i}{R_1 + Ri}$$

$$Q_P = \frac{2 \times \pi (649,747 \times 10^3 Hz)(120 \times 10^{-6} H)}{4\Omega}$$

(3)

$$Q_P = 122,475$$

$$Q_S = \frac{X_L}{R_S}$$

$$Q_S = \frac{2 \times \pi \times f \times L_l}{R_2 + R_l}$$

$$Q_S = \frac{2 \times \pi (649,747 \times 10^3 Hz)(500 \times 10^{-6} H)}{30\Omega}$$

$$Q_S = 68,04$$

(3)

$$2.2 \quad k_c = \frac{1}{\sqrt{Q_P Q_S}}$$

$$k_c = \frac{1}{\sqrt{122.47 \times 68.04}}$$

$$k_c = 0,11$$

(2)