T1400(E)(N12)T

NOVEMBER EXAMINATION

NATIONAL CERTIFICATE

RADIO AND TELEVISION THEORY N2

(11040832)

12 November 2014 (Y-Paper)
13:00–16:00

This question paper consists of 4 pages and 2 formula sheets.

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1. Answer ALL the questions.

2. Read ALL the questions carefully.

3. Number the answers according to the numbering system used in this question paper.

4. ALL the sketches and diagrams must be large, clear and neat.

5. Keep questions and subsections of questions together.

6. Show all the steps and calculations.

7. Write neatly and legibly.

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1.5 What is a rejector circuit? (2)
[17]

QUESTION 2

2.1 Define the time constant of a capacitor. (3)

2.2 How long does it take to charge the capacitor fully? (1)

2.3 A 9 Volt DC battery is connected to a 100 KΩ resistor and a capacitor of 0.01 µF in series.

Determine the following:

2.3.1 The time constant (2)

2.3.2 The voltage across the capacitor after 2 ms (5)

2.3.3 The voltage across the resistor (2)

2.3.4 The instantaneous current after 1 ms (3)

2.3.5 The instantaneous current after 2 ms (3)
[19]

QUESTION 3

A series RLC circuit consists of a 50 µH inductor, a resistor of 7.5 Ω and a capacitor of 40 µF to a 50 V supply.

Determine the following:

3.1 The resonant frequency (2)

3.2 The capacitive reactance (2)

3.3 The inductive reactance (2)

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4.1 Draw a neatly labelled block diagram of an AM superhetrodyne receiver. (10)

4.2 What is super heterodyning? (4)

4.3 What is the function of AVC? (3)
[17]

QUESTION 5

Draw a neatly labelled circuit diagram of an AM detector with the relevant waveforms. **[6]**

QUESTION 6

Draw a neatly labelled block diagram of a 625 line monochrome television receiver. **[15]**

QUESTION 7

Describe the following terms with reference to a television receiver

7.1 Video detector (4)

7.2 AGC (2)
[6]

TOTAL: 100

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Initial charging current through a capacitor $i = \frac{V}{R} \times e^{\frac{t}{RC}}$

Time constant $T = R \times C$

Charge of capacitor $Q = C \times V$

AC THEORY

Inductive reactance $X_l = 2.\pi.F.L$

Capacitance reactance $X_c = \frac{1}{2.\pi.F.L}$

Impedance for RL, RC, and RLC circuits $Z = \sqrt{R^2 + X_L^2}$ $Z = \sqrt{R^2 + X_c^2}$

$Z = \sqrt{R^2 + (X_L \simeq X_C)^2}$

Circuit current for RL, RC, and RLC circuits $I_T = \frac{V}{X_L}$ $I_T = \frac{V}{X_c}$

$I_T = \frac{V}{Z}$

Voltage drop across components $V_R = I \times R$ $V_L = I \times X_L$

$V_C = I \times X_C$

Power factor $\cos\theta = \frac{R}{Z}$

Phase angle $\emptyset = \cos^{-1}\frac{R}{Z}$

Resonant frequency $f_r = \frac{1}{2\pi\sqrt{LC}}$

Q-factor $Q = \frac{1}{R}.\sqrt{\frac{L}{C}}$

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OSCILLOSCOPE CALCULATIONS

Period = Time/Division × Horizontal divisions

Amplitude = Volts/ Division × Vertical divisions

$$\text{Frequency} = \frac{1}{Period}$$

RMS voltage $= 0{,}707 \times Peak$
Average voltage $= 0{,}637 \times Peak$
Voltage (Peak-to-Peak) $= 2 \times Peak$

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