THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

083 RADIO AND TV SERVICING

(For Both School and Private Candidates)

Time: 3 Hours **ANSWERS** **Year: 2017**

Instructions

1. This paper consists of SIXTEEN questions.

2. Answer all questions in section A and B and two questions from section C.

1. For each of the items (i) – (x), choose the correct answer from among the given alternatives and write its letter beside the item number in the answer booklet provided.

(i) The average (d.c) voltage of a power supply normally exist across
A the diodes
B the load
C the capacitor filter
D the inductor filter
E the secondary of the transformer.

Answer: C the capacitor filter
Reason: The capacitor filter smooths the pulsating DC from the rectifier, so the average DC voltage appears across it.

(ii) If β of NPN transistor is 100 and collector current is 100 mA, what is the value of Ie?
A 100.1 mA
B 101 mA
C 110 mA
D 100 A
E 111 mA

Answer: A 100.1 mA
Reason: Ie = Ic + Ib. Since β = Ic/Ib = 100, then Ib = Ic/100 = 1 mA. Therefore, Ie = 100 mA + 1 mA = 101 mA.

(iii) Which of the following component is used to set the voltage gain of a basic amplifier?
A Diode
B Capacitor
C Resistor
D Inductor
E Transistor

Answer: C Resistor
Reason: The gain of a basic amplifier is typically set by resistors in the feedback or biasing network.

(iv) The part of AM wave that carries the useful power is called
A Side bands
B Carrier signal
C Frequency spectrum
D Amplitudes
E Both side bands and carrier.

Answer: A Side bands

Reason: The sidebands contain the actual information (modulating signal) in AM, thus carrying the useful power.

(v) What is the required difference between picture and sound carrier frequencies in all standard television broadcast channels?
A 0.25 MHz
B 1.25 MHz
C 4.5 MHz
D 6 MHz
E 5.5 MHz

Answer: C 4.5 MHz
Reason: In standard TV broadcasting, the sound carrier is located 4.5 MHz above the picture carrier.

(vi) Which of the following quantities is measured in Decibel scale?
A Resistance
B Voltage
C Current
D Power level
E Large signal value

Answer: D Power level
Reason: Decibels measure power ratios, often used to express gain or loss in systems.

(vii) One advantage of using ICs in electronic circuits is
A easy to repair
B simple to construct
C small in size
D easy to solder
E its low packing density.

Answer: C small in size
Reason: ICs combine many components into a single chip, reducing size significantly.

(viii) A series L-C circuit is said to be at the resonance when
A the current is maximum
B the voltage is maximum
C the impedance is low
D the current is minimum
E the impedance is maximum

Answer: A the current is maximum

Reason: At resonance, inductive and capacitive reactances cancel each other, minimizing impedance and maximizing current.

(ix) Which one among the following types of microphones require battery for its operation?
A Carbon microphone
B Dynamic microphone
C Crystal microphone
D Moving coil microphone
E Ribbon microphone

Answer: A Carbon microphone
Reason: Carbon microphones require a DC bias current (battery) to operate and modulate resistance.

(x) The accuracy of an instrument is referred as:
A the ability of an instrument to read the smallest input changes.
B the measure of consistency or reproducibility of the measurement.
C the smallest measurement input change.
D the ratio of change in output signal to the change in the input signal.
E closeness with which an instrument reading approaches the true value of the quantity been measured.

Answer: E closeness with which an instrument reading approaches the true value of the quantity been measured.
Reason: Accuracy describes how close a measured value is to the actual (true) value.

2. A capacitor has the capacitive reactance of 22 Ω at 50 Hz a.c mains. Determine its capacitance.

Given:
$X_c = 22\ \Omega$
$f = 50$ Hz
Use the formula:
$X_c = 1 / (2\pi fC)$

Rearranging for C:
$C = 1 / (2\pi fX_c)$
$C = 1 / (2 \times 3.1416 \times 50 \times 22)$
$C = 1 / (6911.52)$
$C = 1.447 \times 10^{-4}$ F
$C = 144.7\ \mu F$

Answer: 144.7 μF

3. Name three important properties of a good loudspeaker.

A good loudspeaker should have the following properties:

It should produce a wide range of audio frequencies with uniform response, meaning it can accurately reproduce both high and low sounds.

It should have high efficiency so that more sound is produced with less electrical power.

It should have low distortion to ensure that the sound output closely resembles the original audio signal without unwanted changes.

4. Give the meaning of the following terms as applied in electronic communication systems:
(a) Distortion.
(b) Noise.
(c) Fading.

(a) Distortion: This is the unwanted change in the waveform or frequency of a signal as it passes through a communication system, leading to a signal that is different from the original.

(b) Noise: This refers to any unwanted electrical signal that interferes with the communication signal, reducing the clarity or quality of the original message.

(c) Fading: Fading is the variation in signal strength received over time or space due to atmospheric conditions, physical obstructions, or interference, leading to loss or weakening of the signal.

5. (a) Define the term "alignment" as used in radio receivers.
(b) Mention two equipment used in performing radio alignment.

(a) Alignment in radio receivers refers to the process of adjusting the internal circuits such as tuned circuits and intermediate frequency (IF) stages so that the radio can receive signals accurately and with maximum sensitivity and selectivity.

(b) Equipment used in performing radio alignment:
Signal generator
Oscilloscope

6. Mention two major applications of antenna in communication systems.

Antennas are used in communication systems to:
Transmit electromagnetic waves from the transmitter to space or other devices.
Receive electromagnetic waves from space or other sources for processing by the receiver.

7. Sketch the schematic symbols for:
(a) Zener diode.

(b) Temperature sensitive diode.
(c) Photodiode.

(a) Zener diode:
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(b) Temperature sensitive diode (typically a diode with temperature marking or thermistor-style symbol):

(c) Photodiode:

8. Calculate the turns ratio of output transformer to match 5 Ω load to an amplifier having an output impedance of 720 Ω.

Use the formula:
Turns ratio $(N_1/N_2) = \sqrt{(Z_1/Z_2)}$
Where $Z_1 = 720\ \Omega$, $Z_2 = 5\ \Omega$

Turns ratio $= \sqrt{(720/5)} = \sqrt{144} = 12$

Answer: The turns ratio is 12:1

9. (a) Why do video heads rotate at high speeds when recording video tapes?
(b) Mention two types of VTR.

(a) Video heads rotate at high speeds to increase the relative speed between the tape and the head, which allows more data to be written in a shorter time and enables recording of high-frequency signals necessary for video.

(b) Two types of VTR (Video Tape Recorders):
Helical scan VTR
Transverse scan VTR