

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

Thursday, 02nd November 2017 p.m.

Instructions

1. This paper consists of sections A, B and C with a total of **sixteen (16)** questions.
2. Answer **all** the questions in sections A and B and **three (3)** questions from section C.
3. Non programmable calculators may be used.
4. Cellular phones and any unauthorized materials are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).



SECTION A (10 Marks)

Answer all questions in this section.

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 (dc) 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.
- (ii) If β of NPN transistor is 100 and collector current is 100 mA, what is the value of I_E ?
A 100.1 mA B 101 mA C 110 mA
D 100 A E 111 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.
- (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.
- (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
- (vi) Which of the following quantities is measured in Decibel scale?
A Resistance B Voltage C Current
D Power level E Large signal value.
- (vii) One advantages 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.
- (viii) A series LC 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.
- (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.

- (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.

SECTION B (30 Marks)

Answer **all** questions in this section.

2. A capacitor has the capacitive reactance of $22\ \Omega$ at 50 Hz a.c mains. Determine its capacitance.
3. Name three important properties of a good loudspeaker.
4. Give the meaning of the following terms as applied in electronic communication systems:
 - (a) Distortion.
 - (b) Noise.
 - (c) Fading.
5.
 - (a) Define the term 'alignment' as used in radio receivers.
 - (b) Mention two equipment used in performing radio alignment.
6. Mention two major applications of antenna in communication systems.
7. Sketch the schematic symbols for:
 - (a) Zener diode.
 - (b) Temperature sensitive diode.
 - (c) Photodiode.
8. Calculate the turns ratio of output transformer to match $5\ \Omega$ load to an amplifier having an output impedance of $720\ \Omega$.
9.
 - (a) Why do video heads rotate at high speeds when recording video tapes?
 - (b) Mention two types of VTR.

10. For the transistor given in Figure 1, calculate the value of current gain (h_{FE}).

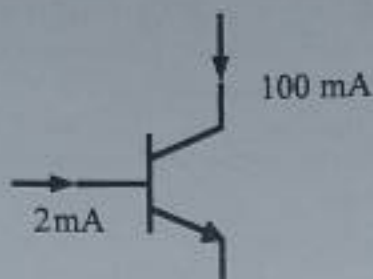


Figure 1

11. The input power of an amplifier is 100 mW when the signal frequency is 5 kHz. If the frequency is increased to 25 kHz, the output power falls to 50 mW. Calculate the change of power in dB.

SECTION C (60 Marks)

Answer **three** (3) questions from this section.

12. (a) (i) Mention the type of feedback that is used in oscillator circuit.
(ii) Give two main applications of oscillator circuits.
- (b) Draw a neat and well labeled circuit diagram of Hartley oscillator.
- (c) If a tank circuit of a Colpitts oscillator is constructed with $C_1 = 0.001 \mu F$, $C_2 = 0.01 \mu F$ and $L = 5 \mu H$, determine the frequency of oscillation of the circuit.
- (d) (i) Why LC circuits are mainly used in Hartley oscillator?
(ii) Mention three shapes of waveform that can be generated by oscillator circuits.
13. (a) (i) Draw a circuit diagram of a PNP transistor in common-base (CB) configuration indicating the input and output quantities.
(ii) Sketch the typical input characteristics of a transistor in CB configuration.
- (b) (i) The current gain of a BJT in CB configuration is 0.99. Determine its current gain when the transistor is connected in CE configuration.
(ii) What will happen if a transistor amplifier will operate without a base current?
- (c) (i) What is the basic bias condition for the proper functioning of a BJT?
(ii) A transistor is a three terminal device. When a transistor is to be connected in a circuit it requires four terminals; two for the input and two for the output. Giving an example, briefly explain how a transistor can be connected to obtain the required four terminals.

- (d) (i) Differentiate "gain of an amplifier" from "amplification".
(ii) Find the input power for an amplifier with a power gain of 20 and output power of 1 W.
14. (a) Mention two major applications of a tuned amplifier circuit in RF stage of a radio receiver.
- (b) LCR circuit has a capacitor of 100 pF in parallel with an inductor of 150 μ H and resistance of 10 Ω . Find;
(i) the resonant frequency
(ii) the Q - factor
(iii) the bandwidth of the resonant circuit.
- (c) A series tuned circuit has $L = 1$ mH, $C = 0.01$ pF and $R = 1$ Ω ; supplied with a voltage of 10 V rms at 100 Hz. Calculate;
(i) the impedance
(ii) the value of X_L at resonance.
15. (a) Draw a well labeled block diagram of a super heterodyne receiver and briefly explain the function of each block.
- (b) Mention two disadvantages of misalignment of a radio receiver.
- (c) An FM radio receiver with IF of 10.7 MHz is tuned to receive a station at 91.9 MHz. Calculate the image frequency.
16. (a) Mention three categories of amplifiers used in radio receivers according to their frequency of operation.
- (b) The gain of AM receiver, intermediate frequency, detector circuit and audio amplifier are 15, 45, 0.5 and 10 respectively when connected in cascade. Find the overall gain of the receiver in decibels.
- (c) If the overall gain of an amplifier is 150:
(i) Express the given overall gain of the amplifier in decibels.
(ii) Find the output voltage when a signal of 15 mV is applied to the input of the amplifier.
- (d) The input signal to a voltage amplifier is 35 mV and the output signal is 15 V. What is the gain of this amplifier in dB?
- (e) Calculate the efficiency of a power amplifier having an output power of 8 W, input voltage of 30 V and working current of 400 mA.