THE UNITED REPULIC 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, 03ʰ November 2016 p.m.**

Instructions

1. This paper consists of sections A, B and C.

2. Answer **all** the questions in sections A and B and **three (3)** questions from section C.

3. Cellular phones are **not** allowed in the examination room.

4. Non programmable calculators may be used.

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 typical operating voltage for LED's ranges from
   A   6V to 10 V
   D   9 V to 10 V
   B   1.5 V to 2.5 V
   E   9 V to 12 V
   C   0.2V to 0.7 V

(ii) The cut off voltage of a silicon diode is
   A   0.1 V
   D   0.6 V
   B   0.2 V
   E   0.5 V.
   C   0.3 V

(iii) Through which mode are medium wave signals received?
   A   Ionospheric layers
   D   Space wave
   B   Ground wave
   E   Medium wave.
   C   Short wave

(iv) How may electron guns are present in a colour TV picture tube?
   A   One
   D   Four
   B   Three
   E   Five.
   C   Two

(v) What is the colour coding of a 47 kΩ ± 20% resistor?
   A   Orange, Blue, Yellow, Silver
   C   Yellow, Violet, Orange, Silver
   E   Black, Green, Black.
   B   Yellow, Violet, Orange
   D   Yellow, Violet, Orange, Gold

(vi) Which of the following current directions is represented by an arrow in the transistor symbol?
   A   Electron current in the emitter
   C   Hole current in the emitter
   E   Hole current in the base.
   B   Electron current in the collector
   D   Donor ion current

(vii) What is the impact of applying forward bias to a junction diode?
   A   Minority charge carrier reduced
   C   Potential barrier increased
   E   Depletion layer widen.
   B   Potential barrier decreased
   D   Majority charge carrier reduced

(viii) Which of the following is the result of increasing the height of the TV receiving antenna?
   A   The range of TV broadcast decreases
   C   Antenna may fail to receive the signal
   E   Image frequencies are doubled.
   B   Signal pick up is less
   D   The range of TV broadcast increases

(ix) The main purpose of applying blanking pulse in TV signal is
    A   to avoid flickering effect   B   to make the retraces invisible
    C   to ensure a uniform scanning rate   D   to reduce the width of the picture
    E   to make synchronization.

(x) Which type of transistor biasing provides good stability using negative feedback?
    A   Base-feedback bias   B   Collector-feedback bias
    C   Voltage divider-feedback bias   D   Emitter-feedback bias
    E   Emitter-base feedback bias.

SECTION B (30 Marks)

Answer **all** questions in this section.

2.   Define the following terms as applied in electronic amplifiers circuits:
    (a) Feedback.
    (b) Negative feedback.
    (c) Positive feedback.

3.   (a) Draw a symbol of variable capacitor.
    (b) A tuned circuit with 40 µH inductor and 1 nF capacitor is used as a source of frequency in a radio receiver. What value of frequency will be produced?

4.   Give the meaning of each of the following terms used in TV systems:
    (a) Chrominance.
    (b) Line frequency.
    (c) Picture element.

5.   (a) What is the meaning of a term transducer as used in telecommunication systems?
    (b) Mention two transducers used in a radio receiver.

6.   Define the following terms as used in radio and television systems:
    (a) Adjacent Channels.
    (b) Adjacent channel Interference.
    (c) Automatic Gain Control.

7.   Mention three commonly used modes of transistor configurations.

8. A 6.8 V zener diode has resistance of 5 Ω. With reference to Figure 1, calculate the actual voltage across its terminals when the current is 20 mA?

Figure 1

9. Give one application for each of the following measuring instruments:
   (a) Ammeter.
   (b) Voltmeter.
   (c) Ohmmeter.

10. (a) Define the term modulation as used in radio systems.
    (b) Give a frequency range for the following:
       (i) Audio Frequency (AF).
       (ii) Ultra High Frequency.

11. The following table shows the color codes for three resistors, R1, R2 and R3. Complete the table by filling in the columns for values and tolerance of the three resistors.

Band	1	2	3	4	Value	Tolerance
R1	Orange	Orange	Brown	Silver		
R2	Brown	Black	Orange	Gold		
R3	Green	Blue	Yellow	None		

SECTION C (60 Marks)

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

12. (a) Draw a well labeled circuit diagram for AM diode detector.

    (b) A communication receiver has an intermediate frequency (IF) of 9 MHz. Calculate the frequency of its oscillator when it is tuned to 15 MHz.

    (c) A carrier of 1 MHz frequency is amplitude modulated by a frequency of 1000 Hz:
       (i) Determine the frequency components of the modulated signal.
       (ii) Draw the frequency spectrum of the modulated wave.
       (iii) Find the bandwidth occupied by the modulated wave.

    (d) Give four advantages of a diode detector that is used for extraction of intelligence signal in AM radio receivers.

13. (a) Which part of a super heterodyne receiver is referred to as the first detector?

    (b) Give four factors that govern the selection of the intermediate frequency (IF) of radio receiver.

    (c) A radio receiver uses a series resonant circuit which has the following circuit elements;
    L = 200 µH, C = 300 pF and R = 12 Ω. The source voltage is 9 V. Calculate;
    (i) the resonant frequency.
    (ii) the impedance at resonance.
    (iii) the source current at resonance.
    (iv) the voltage across each element.
    (v) the Q-factor of the circuit.

14. (a) Define the following terms as used in transistor amplifiers:
    (i) Voltage gain.
    (ii) Current gain.
    (iii) Power gain.

    (b) The voltage gain of the individual stages of a three stage amplifier are 90, 70 and 40. Calculate the overall voltage gain in dB.

    (c) A transistor draws a base current of 150 µA when the collector current is 20 mA. Calculate its α and β.

    (d) The d.c alpha (α) of the transistor in Figure 2 is 0.96. The voltage drop across 2 kΩ resistor is 4 V. Determine the base current.
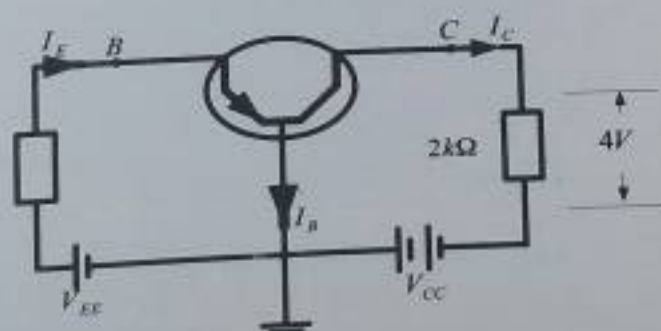

Figure 2

15. (a) List two uses of each of the following equipment in radio works
    (i) Cathode ray oscilloscope (CRO)
    (ii) RF Generator.

    (b) (i) Give the name of the transducer found at the output part of a radio receiver.
    (ii) Draw the symbol for the transducer you named in b (i) above.

(c) Give the main function of each of the following electronic transducers:
    (i)   Light emitting diode.
    (ii) Electric motor.

(d) List five transducers that are found in a television system.

16. (a) Define the following terms as used in electronic systems:
    (i)   Rectification.
    (ii) Filter circuit.

(b) Mention three most commonly used filter circuits in d.c. power supplies.

(c) You have been provided with the following components; two semi-conductor diodes, a transformer with center tapped secondary, a choke and two fixed capacitors. Design a d.c power supply circuit diagram.

(d) In a half-wave rectifier, the turns ratio of the transformer is $N1/N2 = 31:2$. The primary of the transformer is connected to power mains of 220 V, 50 Hz. The average dynamic forward resistance of the diode used is 20 Ω and the load resistance is 1 kΩ. If the threshold voltage of the diode is 0.66 V, determine;
    (i)   the dc current through the load
    (ii) the peak inverse voltage.