THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

# 083 ELECTRONICS AND RADIO REPAIR

(For Both School and Private Candidates)

TIME: 3 Hours 16 November 2000 P.M.

**Instructions**

1. This paper consists of sections A and B.
2. There are SEVEN (7) questions in section A and FIVE (5) questions in section B.
3. Attempt TEN (10) questions, SIX (6) questions from section A and FOUR (4) questions from section B.
4. Write your Examination Number on every page of your answer booklet(s).

This paper consists of 4 printed pages

## SECTION A

1. (a) Explain what is meant by the term free electrons.

   (b) Explain the behaviour of free electrons in presence of an electric field.
   (c) Mention the two types of current flow through a semi-conductor crystal under the influence of an electric field.
   (d) List two common types of donor and acceptor impurities.

2. (a) Mention two types of bi-polar transistors.

   (b) Name three electrodes of the transistor.

   (c) A transistor exhibits a change of 0.995 mA in its collector current for a change of 1 mA in emitter current. Calculate

      (i) the common base short-circuit current gain ($\alpha$).

      (ii) the common-emitter short circuit current gain ($\beta$).

3. (a) The meter scale has 30 divisions. What is the current measured by the milliammeter if the number of divisions indicated on the milliammeter is

      (i) 18 divisions for 3 mA range

      (ii) 21 divisions for 10 mA range

      (iii) 27 divisions for 50 mA range?

   (b) A milliammeter with a meter resistance of 50 ohms and full-scale deflection current of 1 mA has its range of 3 mA and 10 mA. Calculate

      (i) shunt resistance on each range

      (ii) input resistance on each range.

4. A moving coil meter has full-scale deflection current (Ifs) of 10 mA and has a resistance of 10 ohms. The instrument is connected in series with 490 ohm resistor and gives a deflection of half-full scale when connected across a battery.

   (a) Draw the ohmmeter circuit.

   (b) Find the e.m.f. of the battery.

   (c) What is the percentage deflection of the pointer on the scale for supply voltage of 4 V?

5. (a) Name five types of capacitors.

   (b) Two capacitors having capacitance of 10 $\mu$F are connected in series across a 200 volt d.c supply. Calculate

      (i) the charge on each capacitor

      (ii) the p.d. across each capacitor.

6. A tuned circuit is required to cover the frequency range 3.7 MHz to 7.0 MHz. The capacitor is variable and the minimum value of circuit capacitance is 50 pF.

   (a) What is the required value of inductance?

   (b) What is the required maximum value of capacitance?

7. (a) What is the difference between power and energy? Give one unit of each as used in Electrical Engineering.

   (b) An electric bulb is rated at 200 V, 75 W. Calculate

      (i) the current when the bulb is used on 200 V supply.

      (ii) the cost of running the lamp for 500 hours, if electric energy costs Tshs 10 per kilowatt hour.

## SECTION B

8. (a) Draw a block diagram of the frequency modulated transmitter. Label each stage and show the signal waveform at each stage.

   (b) State two advantages of frequency modulation (F.M.) as compared with amplitude modulation (A.M) transmission.

9. (a) Explain the term "television".

   (b) A picture has 400 horizontal and 300 vertical picture elements. Calculate the total number of details in the picture.

10. (a) Give the speed of television waves in free air.

    (b) A television antenna must be equal to half the wavelength of the signal received. Calculate the length of antenna when the television receiver is tuned to a television station transmitting at 300 MHz.

11. In accordance with the Tanzania television system, fill in the missing word or number in the following statements.

    (a) Picture frames are repeated at the rate of ---------- per second.

    (b) The number of scanning lines is ---------- per frame.

    (c) The television channel bandwidth is ---------- MHz.

    (d) Light is connected to video signal by the ----------.

    (e) The number of scanning lines is ---------- per second.

12. The block diagram in Fig. 1 is of a television broadcasting system. The numbered items and blocks represent stages of the system. Write what each block (item) stands for.

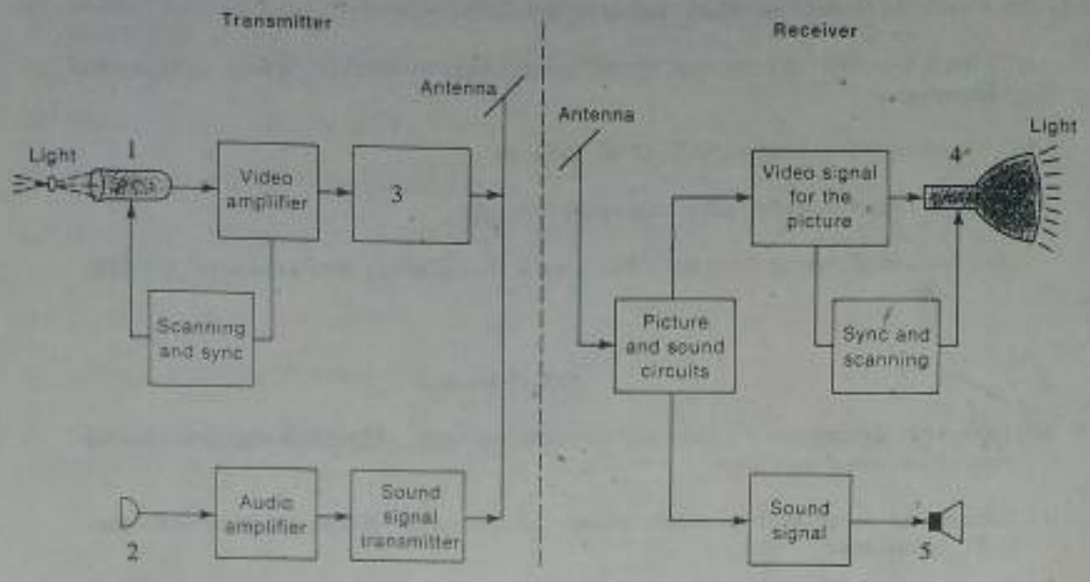


Fig. 1