

**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**

**Monday, 18<sup>th</sup> October 2010 a.m.**

**Instructions**

1. This paper consists of sections A, B and C.
2. Answer **all** questions in sections A and B and **three (3)** questions from section C.
3. Calculators are **not** allowed in the examination room.
4. Cellular phones are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s)

This paper consists of 8 printed pages.



### 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.

- (i) In the n-p-n transistor under forward biased condition p - layer is extremely thin because
- A the material used for p-type semiconductor is very costly.
  - B the p-type semiconductor requires more energy to disturb the electrons in the valence band.
  - C 90% electrons can be collected at the collector.
  - D 90% electrons can be controlled at the emitter.
  - E movement of electrons towards the junction is seized.
- (ii) Which of the following displays has minimum power consumption?
- A Light emitting diode (LED)
  - B Liquid crystal display (LCD)
  - C Nixie tube
  - D Fluorescent lamps
  - E Gas filled tubes.
- (iii) If one wishes to amplify the potential difference between two points in a circuit when neither of these points is grounded, which of the following amplifier will be used?
- A RC coupled amplifier
  - B Transformer coupled amplifier
  - C Differential amplifier
  - D Audio power amplifier
  - E Direct-coupled amplifier.
- (iv) Which of the following statement is true?
- A L-type filter with series C and shunt L is low pass filter
  - B  $\pi$ -type filter with series C and shunt L is low pass filter
  - C T-type filter with series C and shunt L is low pass filter
  - D L-type filter with series C and shunt C is low pass filter
  - E K-type filter with series C and shunt L is low pass filter.
- (v) Which of the following diodes has almost zero minority carrier storage time?
- A Rectifier
  - B Schottky
  - C PIN
  - D Zener
  - E Tunnel



- (vi) Which wave predominates at large distance above the earth?
- A Ground wave
  - B Sky wave
  - C Space wave
  - D Both sky wave and ground wave
  - E Ground wave or space wave.
- (vii) Which of the following oscillator is expected to give highest Q-factor?
- A Crystal controlled oscillator
  - B Tuned oscillator
  - C Wein bridge oscillator
  - D Colpitts oscillator
  - E Hartley oscillator.
- (viii) What is the name of the transformer's coil into which voltage is induced?
- A Step down transformer
  - B Primary winding
  - C Secondary winding
  - D Induction coil
  - E Turn's ratio coil.
- (ix) A silicon controlled rectifier (SCR) is a
- A unijunction device
  - B device with three junctions
  - C a device with four junctions
  - D a combination of diac and triac
  - E PNP device.
- (x) Which of the following is not a correct relationship between  $\alpha$  and  $\beta$ ?
- A  $\beta = \frac{\alpha}{1-\alpha}$
  - B  $\alpha = \frac{\beta}{1-\beta}$
  - C  $\alpha = \frac{\beta}{1+\beta}$
  - D  $1-\alpha = \frac{1}{1+\beta}$
  - E  $1+\beta = \frac{1}{1-\alpha}$



### SECTION B (30 Marks)

Answer **all** questions in this section.

2. Two capacitors  $C_1$  and  $C_2$  are connected in parallel across two points of p.d  $V$  volts. Calculate the:
  - (a) Equivalent capacitance,  $C$  of the circuit.
  - (b) Energy  $E$ , stored in the equivalent capacitance,  $C$ .
3.
  - (a) What is the difference between BJT and JFET?
  - (b) What happens if you interchange the polarities of electrolytic capacitor in a rectifier circuit?
4.
  - (a) What do you understand by the terms '*frequency*' and '*amplitude*' as applied in a sine wave?
  - (b) Calculate the frequency of an electromagnetic wave when travelling in free space if it has a wavelength of
    - (i) 3 cm
    - (ii) 1000 cm
    - (iii) 200 m
5. Find the current in the circuit shown in Figure 1. Assume an ideal diode.



Figure 1

6.
  - (a) What is the '*resonant frequency*' of a tuned circuit of an oscillator?
  - (b) If a tuned circuit has  $L = 58.6 \mu\text{H}$  and  $C = 300 \text{ pF}$ . Calculate the frequency of oscillation.
7. Mention three (3) advantages of using an integrated circuit (ICs)?



8. For a R-L-C series circuit in which  $R = 10\ \Omega$ ,  $L = 100\ \mu\text{H}$  and  $C = 100\ \text{pF}$ , Calculate the:
- Resonant frequency ( $f_r$ ).
  - Impedance ( $Z$ ) of the circuit at resonance.
  - Q - factor of the circuit.
9. (a) If the amplitude of the radio frequency is 10 mV and that of the carrier wave is 20 mV, determine the modulation depth.
- (b) Mention two (2) types of modulation.
10. (a) In the atomic structure of a semiconductor, which energy band do free electrons exist?
- (b) How are holes created in an intrinsic semiconductor?
- (c) Why is current more easily established in a semiconductor than in an insulator?
11. Determine the peak value of the output voltage for the circuit shown in Figure 2.

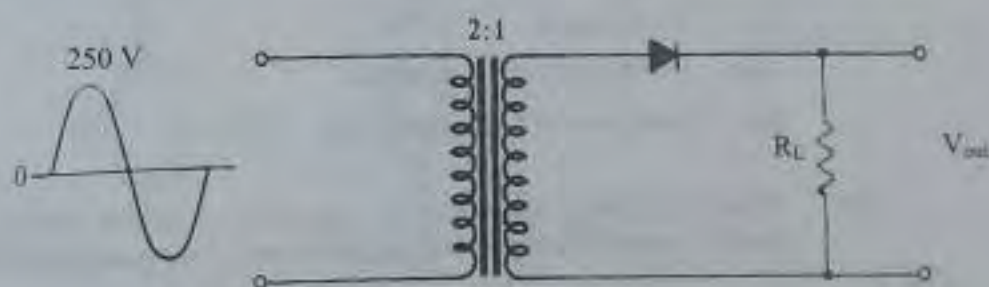


Figure 2



### SECTION C (60 Marks)

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

12. (a) Define the following terminologies.
- (i) Electron gun
  - (ii) Phosphor
  - (iii) Interlacing
  - (iv) Chrominance
  - (v) Raster
- (b) (i) Mention two (2) types of deflection system applied in the cathode ray tube (CRT).
- (ii) List down three (3) primary colours as applied in the colour television.
- (iii) Explain the term 'amplifier gain' as applied in the electronic circuit.
13. (a) Explain the following terms as applied in electronics.
- (i) Transducer
  - (ii) Rectification
  - (iii) Conductivity of the material
  - (iv) Selectivity of a resonant circuit
- (b) Figure 3 is a block diagram of the super heterodyne AM radio receiver. Study it carefully and then indicate the names of the numbered blocks.

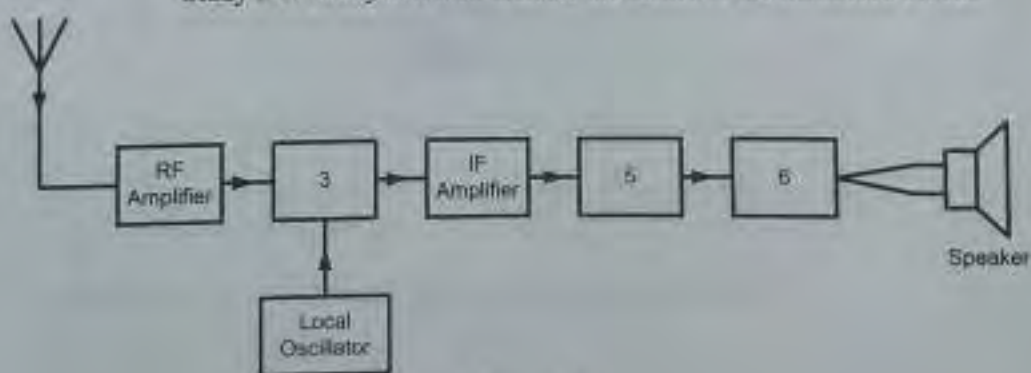


Figure 3



14. An amplifier circuit consists of an NPN transistor, power supply  $+V_{CC}$  is biasing resistor  $R_1$  and  $R_2$  (potential divider method), collector resistor  $R_C$ , emitter resistor  $R_E$  and capacitor  $C_E$ .
- (a) Draw the circuit diagram of the amplifier.
- (b) Write the equation of the load line.
15. (a) Explain the meaning of the following terms in connection with amplifiers.
- (i) Saturation point
- (ii) Cut-off point.
- (b) Study Figure 4 careful then calculate the following values at cut-off point.
- (i) Collector-emitter voltage,  $V_{CE}$
- (ii) Collector current,  $I_C$ .

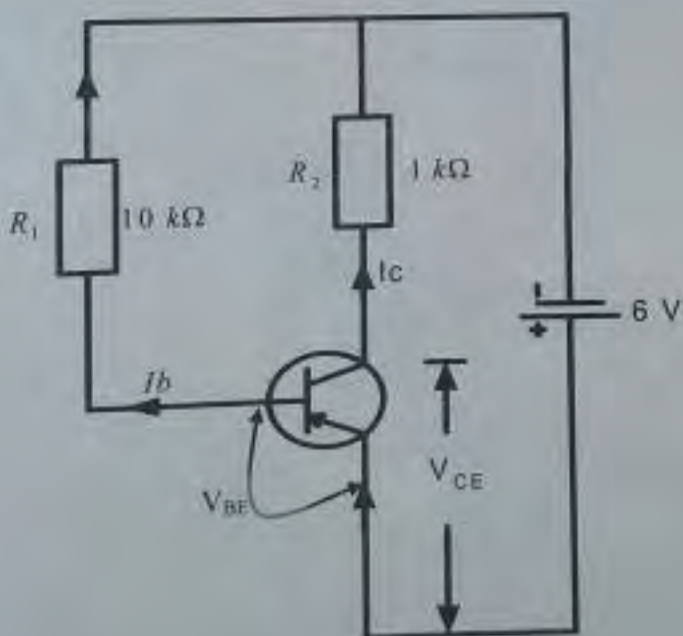


Figure 4



16. (a) Explain the term *television*.
- (b) Give the speed of television waves in free space.
- (c) A wavelength of 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.