

RADIO, TELEVISION AND ELECTRONICS WORKS

1. **PREAMBLE**

This examination syllabus evolved from the Senior Secondary School curriculum for Trade Subjects. It is intended to give candidates insight into the world of Radio, Television and Electronics Works; improve their attitude towards the maintenance and repairs of radio, television and electronic equipment and enable them to appreciate the relationship between science and technology.

2. **OBJECTIVE**

The objective of the syllabus is to test the candidates' knowledge and understanding of the following:

- Workshop Safety Rules and Regulations;
- Basic Electricity;
- Electronic Tools and Instruments;
- Electronic Devices and Circuits;
- Electronic Communication Systems;
- Workshop Practice and Maintenance;
- Entrepreneurship in Radio, Television and Electronics Works.

3. **EXAMINATION SCHEME**

There will be three papers, Papers 1, 2 and 3, all of which must be taken. Papers 1 and 2 shall be a composite paper to be taken at one sitting.

PAPER 1: will consist of forty multiple-choice objective questions, all of which are to be answered in 45 minutes for 40 marks.

PAPER 2: will consist of six short-structured questions. Candidates will be required to answer any four in 1 hour for 60 marks.

PAPER 3: will be a practical test of 2 hour duration. It will consist of three skill-based questions out of which candidates will answer two for 90 marks.

A list of materials for the test shall be made available to schools not less than two weeks before the paper is taken for materials procurement and relevant preparations.

Alternative to Practical Work:

Alternatively, in the event that materials for the actual practical test cannot be acquired the Council may consider testing theoretically, candidates' level of acquisition of the practical skills prescribed in the syllabus. For this alternative test, there will be two compulsory questions to be answered in 2 hours for 100 marks.

Industrial Attachment:

This should be done by the candidates during the long vacation between their SS II and SS III course. It will be supervised and assessed by their subject teachers. It will carry 10 marks.

4. **DETAILED SYLLABUS**

TOPIC	NOTES
<p><u>1. Workshop Safety Rules and Regulations</u></p> <ul style="list-style-type: none"> ● Sources and Prevention of Hazards ● Safety Checks in Servicing Radio Receiver ● Safety Precautions in Television Workshop 	
<p><u>2. Basic Electricity</u></p> <p>2.1 Structure of matter</p> <p>2.2 Conductors, insulators and semiconductors</p>	<p>Concept of safety</p> <p>Sources of hazards</p> <p>Treatments should include electric shock, damp or wet floor, wrong handling of tools, improper workshop dressing, horse play in the workshop</p> <p>Preparation of work areas</p>

2.3 Current, voltage and resistance	<p>Capacitor discharges Working on power lines and live circuits Handling of tools</p>
2.4 Electronic components	<p>Power supplies in T.V. Picture tube High voltage section Component rating</p>
2.5 Resistors and Capacitors	<p>Definition and structure of matter Atomic structure</p> <p>Qualitative treatment only - definition and uses</p>
2.6 Kirchhoff's Current and Voltage Laws	<p>Definition, units and symbols of voltage, current and resistance Laws of attraction and repulsion of charges</p> <p>Identification of components by name, type, graphical symbol, value and rating Treatments should include resistors, capacitors, inductors, diodes, transformers, transistors, integrated circuit etc</p>
2.7 Diodes and Transistors	<p>Graphical symbols, types, values and ratings Colour code of resistors and capacitors Comparison between meter measured and colour code values Testing of capacitors</p>
2.8 Battery	<p>Concepts, definitions and calculations</p>
2.9 Ohm's law	<p>Types, graphical symbols and structure Treatments should include testing for diodes and transistor configuration (CC,CE and CB)</p>
2.10 Electric power	<p>Graphical symbol of a battery(primary cell and secondary cell) and types Testing of battery Treatments should include difference between wet and dry cells</p>
2.11 Direct and Alternating Current	<p>Definition Symbols and relationship between voltage, current and resistance. Resistors in series and parallel</p>
2.12 Alternating waveform	<p>Definition, measurement and calculation</p> <p>Definitions, difference, uses and measurement of d.c. and a.c.</p> <p>Definition and calculation Treatments should include r.m.s., peak, and average values, frequency and</p>

3. Electronic Tools and Instruments

3.1 Electronic hand tools

period in an a.c. waveform

Types and uses

Treatments should include screw drivers, diagonal cutters, soldering gun, soldering iron, lead sucker or de-soldering tools, pocket knife, stripper and soldering wick

3.2 Electronic measuring instruments

Identification, uses and operation

Treatments should include voltmeter, ammeter, ohmmeter, multi meter
Basic a.c. and d.c. circuit, measurements of voltage, current and resistance
Ohmmeter for testing semiconductor devices
Identification of faulty meter

3.3 Fault Finding Equipment

Identification, uses and operation

Treatments should include oscilloscope, signal tracer, digital frequency counter, logic probe, TV analyzer

4. Electronics Devices and Circuits

4.1 Meaning of Electronics and Electronic circuit

Definition

Definition and application

Treatments should include types of emission e.g. Thermionic, photoelectric, field and secondary

4.2 Concept of emission and photoelectric devices

Semiconductor theory and types

Semiconductor diodes

Treatment should include rectification, principles of operation, characteristics and application

4.3 Semiconductors devices

Principle and operation, schematic diagram

Rectification and types

Filters

Construction of stabilized low d.c. power supply unit

4.4 Power Supply Unit

Operation, construction and uses of Class A, B, C and AB amplifiers

Quantitative treatments only

4.5 Amplifiers

Concept of feedback

Differences between types and their advantages

Effect of a positive feedback on amplifiers, bandwidth, noise, gain and distortion

4.6 Resistive, Inductive,

Principle and types of oscillator

Construction of a typical oscillator circuit

Types of multivibrator

Capacitive (RLC) circuits

Treatments to include astable, bistable and monostable

4.7 Feedback

Definition and types

Block diagram, operation and function of each stage

Noise

4.8 Oscillators and
Multivibrators

Definition and classification

Propagation of radio waves

Radio frequency band- VLF, LF, MF, HF, VHF,

UHF,SHF and EHF

Application of frequency range in electronic communication – frequency spectrum to be intensified

5. Electronic Communication Systems

5.1 Electronic
Communication Systems

Definition, types and functions

Treatments should include loudspeaker, microphone, video camera, video display unit(cathode ray tube(CRT),Liquid Crystal Display(LCD))

Definition, principle of operation and types of modulation

AM and FM waveforms and envelopes

Percentage of modulation – modulation index and modulation factor

5.2 Electromagnetic
spectrum

Meaning and function of carrier wave in radio communication.

Definition and types of demodulation

Function(s) and operation

Block diagram and function of each stage

Types of radio receivers – Tuned Radio Receiver(TRF), super heterodyne receivers(FM and AM)

Advantages and disadvantages of each

5.3 Transducer

Definition

Concept and function of tuner in radio receiver

Identification of tuner stage in radio receiver

Definition, types of resonance (series and parallel)

Concept of bandwidth and bandwidth ranges

Calculation involving frequency ranges to determine bandwidth

Treatments should include derivation of the formula for resonant frequency

5.4 Modulation and
demodulation

Elements and types

Transmission and reception

Antenna

Working principle

Block diagram

Stages

5.5 Radio transmitter and receiver

Principle of scanning
Video signals
Principle of FM detection

Concept of Television
Function and operation
Application of television system

5.6 Selectivity and sensitivity

Block diagram and function of each stage
Processing of picture and sound signal

5.7 Resonant circuit

Primary colours in television
Colour television systems and standards – PAL, SECAM and NTSC
Colour signal components

5.8 Satellite Communication Systems

Techniques and precautions
Types of solder
Types of flux – amber resin and NaCl solutions

5.9 Television Transmitter

Dismantling and reassembling of power supply unit in a radio set
Dismantling and reassembling RF, IF detector
Stages in a radio receiver set
AF amplifier circuit
Installation and maintenance of a car radio set

5.10 Image and Sound Reproduction in TV receiver

Diagnose fault by using fault finding pieces of equipment and logical trouble shooting procedure
Components responsible for faults
Remedies for the faults

5.11 Monochrome Television Receiver

Alignment of RF and IF stages of a radio set using the necessary equipment and tools

5.12 Principles of operation of Colour Television Receiver

Use of multimeter
Treatments should include measurement of the correct value of current, voltage and resistance in active and passive electronic components and circuits

5.13 Principle of Colour Signal, Transmission and Reception

Procedure for TV repairs
Use of service information manual and circuit diagram
Identification of symptoms and repair of faults
Fault clearing instruments

Symptoms of faults
Fault clearing at each stage

6. Workshop Practice and Maintenance

6.1 Soldering and Desoldering in Electronic Circuits

6.2 Electronic Repairs

6.3 Fault finding and repairs in radio receiver

6.4 Electronic Measuring Instruments

6.5 Diagnosis and Repair of Black and White TV Receiver

6.6 Diagnose and Repair of a Colour Television Receiver

7. Entrepreneurship in Radio, Television and Electronic Works

7.1 Business Management and Finance

Static and dynamic colour convergence comparison
Colour bar generator and signal testing

Accounting practices
Cost benefit analysis
Purchasing method
Business records(Accounting ledger, Repair order form, Inventory sheet)
Sources of capital e.g. Banks and Credit Unions

Daily appearance at work
Customer psychology
Working relations
Telephone courtesy

Business Opportunities in Radio and TV Work
Satellite installation
Electronic specialist
Radio and TV consultant
Radio and TV technician
Sales and Service Craft man
Antenna and TV installation work

7.2 Customer Relations

7.3 Business Opportunities
in Radio, TV and
Electronics works

● **LIST OF FACILITIES AND MAJOR EQUIPMENT/MATERIALS REQUIRED**

- Screw drivers
- Diagonal cutters
- Soldering gun, iron and lead
- Desoldering tools
- Pocket knife
- Stripper
- Semiconductor diodes
- Digital and analog multimeters
- Loudspeaker, microphone
- Cathode Ray Tube/LCD
- Nose pliers
- Old electronics panel
- Resistors, capacitors, inductors, transistors
- Vero board/breadboard
- D.C. power supplies
- Transformers
- Radio and television sets
- Oscilloscope
- Signal generator
- Magnifying glass
- Pattern generator (TV)