

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:

- (i) Workshop Safety Rules and Regulations;
- (ii) Basic Electricity;
- (iii) Electronic Tools and Instruments;
- (iv) Electronic Devices and Circuits;
- (v) Electronic Communication Systems;
- (vi) Workshop Practice and Maintenance;
- (vii) 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> <p>1.1 Sources and Prevention of Hazards</p> <p>1.2 Safety Checks in Servicing Radio Receiver</p> <p>1.3 Safety Precautions in Television Workshop</p> <p><u>2. Basic Electricity</u></p> <p>2.1 Structure of matter</p>	<p>Concept of safety Sources of hazards 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 Capacitor discharges Working on power lines and live circuits Handling of tools</p> <p>Power supplies in T.V. Picture tube High voltage section Component rating</p> <p>Definition and structure of matter Atomic structure</p> <p>Qualitative treatment only - definition and uses</p>

2.2 Conductors, insulators and semiconductors	Definition, units and symbols of voltage, current and resistance
2.3 Current, voltage and resistance	Laws of attraction and repulsion of charges
2.4 Electronic components	Identification of components by name, type, graphical symbol, value and rating Treatments should include resistors, capacitors, inductors, diodes, transformers, transistors, integrated circuit etc
2.5 Resistors and Capacitors	Graphical symbols, types, values and ratings Colour code of resistors and capacitors Comparison between meter measured and colour code values Testing of capacitors
2.6 Kirchhoff's Current and Voltage Laws	Concepts, definitions and calculations
2.7 Diodes and Transistors	Types, graphical symbols and structure Treatments should include testing for diodes and transistor configuration (CC,CE and CB)
2.8 Battery	Graphical symbol of a battery(primary cell and secondary cell) and types Testing of battery Treatments should include difference between wet and dry cells
2.9 Ohm's law	Definition Symbols and relationship between voltage, current and resistance. Resistors in series and parallel
2.10 Electric power	Definition, measurement and calculation
2.11 Direct and Alternating Current	Definitions, difference, uses and measurement of d.c. and a.c.
2.12 Alternating waveform	Definition and calculation Treatments should include r.m.s., peak, and average values, frequency and period in an a.c. waveform

<p>3. <u>Electronic Tools and Instruments</u></p> <p>3.1 Electronic hand tools</p> <p>3.2 Electronic measuring instruments</p> <p>3.3 Fault Finding Equipment</p>	<p>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</p> <p>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</p> <p>Identification, uses and operation Treatments should include oscilloscope, signal tracer, digital frequency counter, logic probe, TV analyzer</p>
<p>4. <u>Electronics Devices and Circuits</u></p> <p>4.1 Meaning of Electronics and Electronic circuit</p> <p>4.2 Concept of emission and photoelectric devices</p> <p>4.3 Semiconductors devices</p> <p>4.4 Power Supply Unit</p> <p>4.5 Amplifiers</p>	<p>Definition</p> <p>Definition and application Treatments should include types of emission e.g. Thermionic, photoelectric, field and secondary</p> <p>Semiconductor theory and types Semiconductor diodes Treatment should include rectification, principles of operation, characteristics and application</p> <p>Principle and operation, schematic diagram Rectification and types Filters Construction of stabilized low d.c. power supply unit</p> <p>Operation, construction and uses of Class A, B, C and AB amplifiers</p> <p>Quantitative treatments only</p>

<p>4.6 Resistive, Inductive, Capacitive (RLC) circuits</p> <p>4.7 Feedback</p> <p>4.8 Oscillators and Multivibrators</p>	<p>Concept of feedback Differences between types and their advantages Effect of a positive feedback on amplifiers, bandwidth, noise, gain and distortion</p> <p>Principle and types of oscillator Construction of a typical oscillator circuit Types of multivibrator Treatments to include astable, bistable and monostable</p>
<p>5. <u>Electronic Communication Systems</u></p> <p>5.1 Electronic Communication Systems</p> <p>5.2 Electromagnetic spectrum</p> <p>5.3 Transducer</p> <p>5.4 Modulation and demodulation</p>	<p>Definition and types Block diagram, operation and function of each stage Noise</p> <p>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</p> <p>Definition, types and functions Treatments should include loudspeaker, microphone, video camera, video display unit(cathode ray tube(CRT),Liquid Crystal Display(LCD))</p> <p>Definition, principle of operation and types of modulation AM and FM waveforms and envelopes Percentage of modulation – modulation index and modulation factor</p> <p>Meaning and function of carrier wave in radio communication. Definition and types of demodulation</p>

<p>5.5 Radio transmitter and receiver</p>	<p>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</p>
<p>5.6 Selectivity and sensitivity</p>	<p>Definition Concept and function of tuner in radio receiver Identification of tuner stage in radio receiver</p>
<p>5.7 Resonant circuit</p>	<p>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</p>
<p>5.8 Satellite Communication Systems</p>	<p>Elements and types Transmission and reception Antenna</p>
<p>5.9 Television Transmitter</p>	<p>Working principle Block diagram Stages</p>
<p>5.10 Image and Sound Reproduction in TV receiver</p>	<p>Principle of scanning Video signals Principle of FM detection</p>
<p>5.11 Monochrome Television Receiver</p>	<p>Concept of Television Function and operation Application of television system</p>
<p>5.12 Principles of operation of Colour Television Receiver</p>	<p>Block diagram and function of each stage Processing of picture and sound signal</p>
<p>5.13 Principle of Colour Signal, Transmission and Reception</p>	<p>Primary colours in television Colour television systems and standards – PAL, SECAM and NTSC Colour signal components</p>

<p>6. <u>Workshop Practice and Maintenance</u></p> <p>6.1 Soldering and Desoldering in Electronic Circuits</p> <p>6.2 Electronic Repairs</p> <p>6.3 Fault finding and repairs in radio receiver</p> <p>6.4 Electronic Measuring Instruments</p> <p>6.5 Diagnosis and Repair of Black and White TV Receiver</p> <p>6.6 Diagnose and Repair of a Colour Television Receiver</p> <p>7. <u>Entrepreneurship in Radio, Television and Electronic Works</u></p>	<p>Techniques and precautions Types of solder Types of flux – amber resin and NaCl solutions</p> <p>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</p> <p>Diagnose fault by using fault finding pieces of equipment and logical trouble shooting procedure Components responsible for faults Remedies for the faults Alignment of RF and IF stages of a radio set using the necessary equipment and tools</p> <p>Use of multimeter Treatments should include measurement of the correct value of current, voltage and resistance in active and passive electronic components and circuits</p> <p>Procedure for TV repairs Use of service information manual and circuit diagram Identification of symptoms and repair of faults Fault clearing instruments</p> <p>Symptoms of faults Fault clearing at each stage Static and dynamic colour convergence comparison Colour bar generator and signal testing</p> <p>Accounting practices Cost benefit analysis</p>
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7.1 Business Management and Finance	Purchasing method Business records(Accounting ledger, Repair order form, Inventory sheet) Sources of capital e.g. Banks and Credit Unions
7.2 Customer Relations	Daily appearance at work Customer psychology Working relations Telephone courtesy
7.3 Business Opportunities in Radio, TV and Electronics works	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

5. LIST OF FACILITIES AND MAJOR EQUIPMENT/MATERIALS REQUIRED

- (1) Screw drivers
- (2) Diagonal cutters
- (3) Soldering gun,iron and lead
- (4) Desoldering tools
- (5) Pocket knife
- (6) Stripper
- (7) Semiconductor diodes
- (8) Digital and analog multimeters
- (9) Loudspeaker, microphone
- (10) Cathode Ray Tube/LCD
- (11) Nose pliers
- (12) Old electronics panel
- (13) Resistors, capacitors, inductors, transistors
- (14) Vero board/breadboard
- (15) D.C. power supplies
- (16) Transformers
- (17) Radio and television sets
- (18) Oscilloscope
- (19) Signal generator
- (20) Magnifying glass

(21) Pattern generator (TV)