

HOD ELECTRICAL ENGINEERING



REGULATIONS AND SYLLABUSES

272

RADIO, TELEVISION AND ELECTRONICS  
TECHNICIANS COURSE

THE EAST AFRICAN EXAMINATIONS COUNCIL

REGULATIONS AND SYLLABUSES

272

RADIO, TELEVISION AND ELECTRONICS  
TECHNICIANS COURSE

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SENIOR STAFF OF THE COUNCIL AND ITS CONSULTATIVE MACHINERY (iii)

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## THE COUNCIL AND ITS CONSULTATIVE MACHINE:

### 1. The East African Examinations Council:

The Council consists of a Chairman, who is the Vice-Chancellor of one of the Universities of East Africa (the office is held in rotation for a period of three years), six members appointed by the Senates of the three Universities, three members appointed by each of the three Governments of East Africa, two Heads of Schools from each of the three countries of East Africa, two representatives of the East African Community, and one representative of the University of Cambridge Local Examinations Syndicate.

### 2. The Technical Examinations Committee:

The Technical Examinations Committee of the Council is responsible for the following:-

entry regulations, regulations for award of certificates, forms of certificates awarded by the Council, approval of subjects to be examined, subject syllabuses prepared by International Advisory Committees, appointment of examiners and approval of Technical examination centres.

The Committee consists of a Chairman elected from the members. The Committee membership includes the following:-

- (a) Three representatives appointed by the three Governments partner states.
- (b) Three representatives from the Universities of East Africa.
- (c) Three Principals or their representatives of the Technical Colleges in East Africa.
- (d) Two representatives from East African Community.
- (e) One Director of Industrial Training Board of each partner State.
- (f) One representative of the Federation of employers from each partner State.
- (g) One representative from East African Institute of Engineers.
- (h) The Secretary to the Council.

### 3. International Advisory Committees:

The Council has International Advisory Committees to cover every subject or group of subjects examined. Each committee includes appropriate representatives from each country, examiners and professional men. The International Advisory Committees are responsible for drawing up and revising syllabuses and receiving criticisms and suggestions concerning existing syllabuses. They also work closely with the National Advisory Panels which are responsible for devising syllabuses suitable for their respective countries. The Secretary to Council or his representative is an ex-officio member of each Committee.

### 4. National Advisory Panels:

There are National Advisory Panels in each of the three countries whose function is to advise the Government on the examinations to be made available in the country and to make representations as appropriate to the Council in regard to the examinations and other matters with which the Council is concerned. Each country appoints members to its National Advisory Panels.

## REGULATIONS AND SYLLABUSES

FOR

## 272 - RADIO, TELEVISION AND ELECTRONICS TECHNICIANS' COURSE

### REGULATIONS

#### INTRODUCTION

1. This scheme for the course is intended for technicians undergoing training or employed in the maintenance of electronic equipment, both domestic and professional. Its purpose is to provide a sound understanding of them. In addition to the technical subjects, General Studies is included, in order to develop the students' ability to absorb, interpret and transmit information, whether in spoken or written form, and to contribute to their general education and personal development. The scheme has been designed to be complementary to the training and experience which the students will gain in their employment.

#### COURSE OF STUDY

2. The scheme has been devised on the assumption that normally students will attend a technical college on a part-time day or block release basis. It is in three stages. Part 1 gives a broad introduction to the theoretical and practical aspects of the courses. Part 2 and Part 3 provide for further study of one of a variety of aspects of the field covered in Part 1. Part 1 and Part 2 are each to be covered in about seven hundred and eighty hours and Part 3 about one hundred and fifty hours for each subject studied. Part 1 is divided into two stages (R1 and R2), each intended to occupy half the time allowed. Part 2 is similarly divided into R3 and R4 stages. At Part 3, it is intended that two of a range of options be studied, either together or consecutively.

3. The subjects of the course are as shown below:-

#### Part 1

R1: Mathematics  
Engineering Science  
Drawing and Processes  
General Studies and Reports

R2: Mathematics  
Engineering Principles  
Radio and Electronics

Part 2

R3: Mathematics  
Engineering Principles  
Radio and Electronics

R4: Testing methods  
and either

Radio and Television Theory and Practice

or

Industrial Electronics Theory and Practice

Part 3

Any two of the following:-

Wired and Closed Circuit Television Systems  
F.M. and Multiplex Stereo  
Colour Television  
Electronic, Supervisory and Indication Systems  
Microelectronic and Semi-conductor Technology.

4. General Studies are regarded as an integral part of the course and the aim should be to allocate about 60 hours for R1 and R2 in Part 1. There is no set syllabus for the subject and Colleges are free to devise their own syllabuses and approach.

ENTRY TO COURSE

5. The E.A.E.C. recommends that students should satisfy the following conditions or have reached the appropriate standard by an approved alternative route.

a. Part 1 - R1

Completion of the East African Certificate of Education Examinations conducted by the E.A.E.C. at ordinary level, with credit in English, Mathematics and one relevant Science subject, or equivalent standard.

b. Part 2 - R3

i. A pass in the Part I examination of the course.

ii. A pass in the Part I examination in Electrical Installation Technicians Course; provided that the student entering the Part 2 of the course by this route has passed Radio and Electronics (R2) of the course.

iii. A pass in the Part 1 examination in Telecommunication Technicians' Course, which includes Radio and Line Transmission option.

iv. A Credit Pass in the final examination in Electronics Servicing OR Radio and Television Servicing, together with Mathematics to the standard of Mathematics (R2) and proficiency in English.

c. Part 3

A pass in the Part 2 examination of the course.

6. COUNTRIES OUTSIDE EAST AFRICA

This scheme is available to countries outside East Africa, at those colleges which have received the necessary approval. Applications for approval of a course should be made on a form, prescribed by the E.A.E.C.

7. EXAMINATION REGULATIONS - GENERAL

The E.A.E.C. examinations are conducted in accordance with its General Regulations and Examinations Time-table. Candidates must submit their entries through an examination centre by the date specified in the Time-table.

8. If, during the currency of the scheme, the E.A.E.C. deems it appropriate to modify the pattern of the examination and awards, the necessary changes to the regulations will be notified to colleges in advance of their being applied.

9. All examinations will be set and answered in English though examiners will not be required to assess the standard of English.

ELIGIBILITY FOR ENTRY TO EXAMINATIONS

10. Candidates enter for the E.A.E.C. examinations as either internal or external candidates.

a. Internal Candidates

Internal candidates are those who, at the time of entry to the examination are undertaking (or have already completed) the course (including General Studies for Part 1) at a technical college or other approved establishment.

b. External Candidates

Candidates who have valid reasons for not having attended a course may exceptionally be given permission to enter as external candidates for Parts 1, 2 and 3 provided that they can satisfy the E.A.E.C. as to their industrial experience, preparation for the examination, and proficiency in English. Applications must be received at the E.A.E.C. on an approved form, not later than two months before the closing date of entry to the examinations. They must pass the examinations in Parts 1, 2, and 3 in that sequence.

## EXAMINATIONS

11. The examinations of the course are listed below. There will be one examination series each year in December.

### Part I Examinations

272-1-01	Mathematics	3 hours
272-1-02	Engineering Principles	3 hours
272-1-03	Radio and Electronics	3 hours

NOTE: i. Internal candidates from exempted Institutions are permitted, but not required to take the Council set examinations at the Part I level.

ii. Part I examination must be passed at the same sitting.

### Part 2 Examinations

272-2-01	Testing Methods	3 hours
272-2-02	Radio and Television Theory	3 hours
272-2-03	Radio and Television Fault Diagnosis	2 hours
272-2-04	Industrial Electronics Theory	3 hours
272-2-05	Industrial Electronics Fault Diagnosis	2 hours

Note: In the Part 2 examinations candidates must pass at the same sitting Testing Methods and EITHER Radio and Television Theory and Radio and Television Fault Diagnosis OR Industrial Electronics Theory and Industrial Electronics Fault Diagnosis.

### Part 3 Examinations

272-3-01	Wired and-Closed Circuit Television Systems	3 hours
272-3-02	F.M. and Multiplex Stereo	3 hours
272-3-03	Colour Television	3 hours
272-3-04	Electronic Supervisory and Indication Systems	3 hours
272-3-05	Micro-electronic and Semi-conductor technology	3 hours

Note: Where more than one Part 3 examination is taken, they need not be taken at the same sitting.

## EXAMINATION RESULTS

12. For examination results at Part 1 and Part 2 levels, each candidate will receive a result slip indicating the grade in each paper and the class of results obtained in the examination as a whole. The grades are from 1 to 8, 1 and 2 being distinctions 3 and 4 credit, 5 and 6 pass and 7 and 8 fail.

There are four classes of results:

Pass with Distinction, Pass with Credit, Pass, Fail.

## HOD ELECTRICAL ENGINEERING

At part 3, each candidate will receive a result slip, indicating the performance in each paper.

### AWARD OF CERTIFICATES

13. For Parts 1, II and III levels certificates will be issued to successful candidate on application, showing the level of examination, the class result obtained in the examination as a whole and the optional subject. The result is classed as:

- 13: Pass with Distinction
- Pass with Credit
- Pass

### FULL TECHNOLOGICAL CERTIFICATE

14. A full Technological Certificate in Radio, Television and Electronics will be awarded to a candidate who:-

- a. is at least 21 years of age.
- b. has had at least two years relevant post apprenticeship industrial experience,
- c. holds a Radio, Television and Electronics Technician's Parts 2 & 3 Certificates, and
- d. has passed (not necessarily at the same sitting or in any particular order) two Part 3 papers.

15. Candidates wishing to apply for the F.T.C. must write to the E.A.E.C. for the appropriate form, quoting subject 272 - Radio, Television and Electronics.

### APPROVAL OF COURSE

16. Colleges intending to provide the course must, before mounding the course, seek approval of the E.A.E.C. in accordance with the published regulations. Applications for approval should be made on the prescribed form obtainable from the E.A.E.C.

### RECORD OF STUDENTS' WORK

17. Record of marks awarded for class work, laboratory work and other practical work must be kept by the colleges and the details must be available for inspection by the E.A.E.C. or its examiners when called for, such records must be kept for at least one year after the examination.

### ATTENDANCE AND COURSE WORK REQUIREMENTS

18. Each candidate will be required to make at least 75% of the possible attendance in each subject, including General Studies, and to complete satisfactorily the schedule of class work, laboratory work and practical work for the course.

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SYLLABUSES

- Note: 1. Throughout this course SI units must be used.  
2. It is recommended to colleges that the use of the slide rule in all calculations be encouraged.

LABORATORY WORK

This course places a strong emphasis on practical work, which forms 50% of the optional subject content, together with a proportion of the principles of Part I and Part II. It will take the form of project work, formal laboratory work and other practical activities. In addition, colleges are required to keep records of practical work and candidates must keep practical log books. E.A.E.C. reserves the right to visit colleges to see that the practical facilities, equipment and accommodation meet the requirements of the course. Specific practical tasks carried out under supervision are also under consideration.

PART I (Stages R1 and R2)

MATHEMATICS

AIDS TO CALCULATIONS

Need for use of significant figures and approximations. Error and appreciation of error. Use of powers of ten in dealing with unwieldy numbers, e.g.  $22,400 = 2.24 \times 10^4$ ,  $0.00427 = 4.27 \times 10^{-3}$ . Percentages and per unit values.

Use of common logarithmic table for multiplication and division. Use of tables of squares, square roots and reciprocals. Use of logarithmic tables for calculations involving positive and negative whole numbers and fractional powers. The necessity for rough checks. The change of base of a logarithm, the use of natural (Napierian) logarithms.

Construction and simple theory of slide rule. Use of slide rule for calculations including squares and square roots. Use of calculating machines. Binary numbers, addition, subtraction and multiplication. Change to denary number and denary to binary.

GEOMETRY

Mensuration of solids such as cylinders, cones, spheres rings and hollow cylinders.

TRIGONOMETRY

Circular measure, the radian, conversion from radians to degrees. Trigonometrical ratios, sine, cosine, tangent, cosecant, secant and cotangent. Simple relations:

$$\tan \theta = \frac{\sin \theta}{\cos \theta}, \sin^2 \theta + \cos^2 \theta = 1, \sec^2 \theta = 1 + \tan^2 \theta = \operatorname{cosec}^2 \theta = 1 + \cot^2 \theta$$

Trigonometrical ratios for angles of any magnitude, defined using a rotating phasor. Solution of triangles using sine and cosine rules, area of any triangle, problems of heights and distances.

ALGEBRA

Indices and their laws, positive and negative whole number and fractional powers. Use of logarithmic tables for calculations involving positive and negative whole numbers and fractional powers. Transposition of simple algebraic formulae. Evaluation of formulae using practical values. Formation and algebraic solution of simple linear simultaneous equations involving two or three unknowns. Simple electrical circuit problems e.g. Kirchhoff's Laws. Formation of quadratic equations and their solutions by factors, completing the square and by the use of the formula (without proof). Practical problems leading to quadratic equations.

GRAPHS

Plotting of graphs for equations of the form  $y = mx + c$ ,  $y = \frac{1}{x}$ ,  $y = ax^2 + x$  straight line graphs, meaning of the slope and intercept. Use of straight line graph for determination of the law of the form  $y = mx + c$ ,  $y = \frac{1}{x}$ ,  $y = ax^2 + b$  and  $y = ax^n$ . Solution by conversion to straight line form by the use of logarithmic paper or scale. Graphical solution of linear simultaneous equations involving two unknowns and of quadratic equations.

Mid-Ordinate rule, the determination of the areas of irregular figures, average value and r.m.s. value of alternating current waveforms. Vectors, graphical representation and addition, addition by Pythagoras theorem, by trigonometry and by resolution. Application of phasors to the solution of electrical circuit problems.

Graphs of sinusoidal waves of different amplitudes and phase angles. Meanings of amplitude, angular velocity, phase angle, wave-length, frequency and period. The relations between these quantities where applicable. The relation between sine and cosine waves. Graphical addition of sinusoidal waveforms of the same frequency but of different magnitude and phase.

Ratios, proportion and variations. Engineering applications.

Note: 1.

PART I (Stages R1 and R2)

ENGINEERING PRINCIPLES

Note: SI units must be used throughout

1. Revision of definitions and units of mass, force and weight scalar and vector representation of a force. Resolution of a single force into rectangular components, application to simple practical problems. Resultant of two forces acting at a point determined graphically and by taking rectangular components. Triangle of forces and extension to polygon of forces, resolution of forces graphically and by resolution into components. Descriptive

tion of the turning effect of a force, unit of torque, calculation of torque for simple practical problems.

2. Definitions and units of velocity and acceleration. Distance-time and velocity-time graphs. Resolution of velocities. Introduction to Newton's laws of motion and relation between force, mass and acceleration. Friction: coefficient of friction, friction force as equal to normal reaction. Simple practical traction problems involving lifts, hoists and vehicles.

3. Definitions and units of work and power. Work done by a force applied along, or at an angle to, the line of motion. Work done in lifting and by torque; work done against friction. Power as the rate of doing work; simple examples. Simple treatment of potential kinetic energy, laws and gain of energy. Power as the rate of change of energy. Efficiency defined as output over input work; percentage and per unit presentation. Definitions of velocity ratio and mechanical advantage; their calculation for simple machines, such as lever, screwjack and gear train.

4. Elementary idea of direct and alternating current. Electrical current as a flow of charge. Difference between conductors, semi-conductors and insulators. The e.m.f. as driving force produced by a source potential difference between two points in a circuit. Resistance as ratio of potential difference between two points in a circuit; to current. Ohm's law. Units of current, charge, potential difference resistance and conductance. Heat energy produced by current flow through resistance. Resistors in series and parallel. Direct current circuit problems on the parallel circuit, the series parallel circuits. Calculations on power and energy dissipated in simple series and parallel circuits. Examples of methods of transfer of power and energy, including simple calculations relating to electrical and thermal systems. Simple problems on cost of energy.

5. Relationship between resistance and conductor dimensions and dependence on material. Resistivity. Effect of temperature on resistance (introduced graphically), temperature coefficient of resistance referred to resistance at  $0^{\circ}\text{C}$ .

6. Elementary description of primary and secondary cells; lead-acid and nickel-alkaline cells. E.M.F. of a cell, internal resistance, effect on terminal voltage. Main characteristics of typical primary and secondary cells. Cells in series and parallel. Practical forms of primary and secondary batteries. Principles of charging methods of secondary batteries. Simple calculations. Basic Maintenance.

7. Description of the magnetic field produced by a current in a straight conductor, two parallel conductors and coil. Factors affecting the magnetizing force, the flux-density resulting from a coil carrying a current. The units of flux and flux-density. Force on a current-carrying conductor in a field as B.I. Practical applications of this force such as the motor and moving coil devices. Calculations relating to the transfer of electrical power and energy to mechanical system.

8. Principles and simple descriptive treatment of moving coil and moving-iron instruments, including arrangements for deflecting, controlling and damping. D.C. ammeters and Voltmeters; applications. The effect of instrument resistance on circuit conditions. Shunts and multipliers, multirange and multi-purpose instruments.

9. Induced e.m.f. in moving and stationary circuits. Faraday's Law of electro-magnetic induction; introduction to Lenz's law. Eddy currents and the need for laminated core.

10. Kirchhoff's laws and superposition principles applied series-parallel circuits.

11. The magnetic circuit, magnetomotive force, magnetizing force, flux, flux-density, permeability, reluctance. Comparison between the magnetic circuit and the electric circuit. Relative permeability and its dependence on magnetizing force and flux-density. Description of magnetization curve and hysteresis loop; idea that energy loss is associated with the loop (but no calculations). Magnetic calculations for series circuits using magnetization curve or ampere turn method of solution excluding leakage and fringing. Path of magnetic flux in relays; unpolarised and polarised.

12. Induced e.m.f.; magnitude determined from rate of change of flux linkage. Description of effects of self and mutual inductance, direction of induced e.m.f. calculation of e.m.f. of self and mutual inductance from rate of change of flux linkage or rate of change of current. Unit of inductance. Inductance in series, adding and opposing. Statement of energy stored in an inductor as  $\frac{1}{2} LI^2$  joules. Practical applications such as ignition system, transformer, etc.

13. Storage of charge in a capacitor. Relationship between charge and applied voltage; definition of capacitance. Capacitors in series and parallel; and hence relationship between capacitance and dimensions. Capacitance of the parallel plate capacitor. Potential gradient and dielectric breakdown. Importance of working voltage of capacitors. Statement of energy stored in a charged capacitor as  $\frac{1}{2} CV^2$  joules. Examples of construction of fixed and variable capacitors.

14. Generation of an alternating e.m.f. by rotation of a coil in a uniform magnetic field. Definition of cycle, period and frequency. Reason for use of sine wave; peak, half wave average and r.m.s. values by graphical means. Interpretation of expression of the form  $V = V_{\text{max}} (\sin 2\pi ft + \theta)$ . Wave form plotting from rotating vector, addition and subtraction of sine waves, resultant wave, effect of phase shift. Use of phasors for addition and subtraction; comparison of resultant with that obtained by plotting waves.

15. Resistance, inductance and capacitance in a.c. circuit considered separately in series and in parallel combinations. Impedance as the ratio voltage/current. (Examination questions will not include the resonant condition). Power in a.c. circuits.

16. Measurement of resistance by ammeter - voltmeter method (including allowance for effect of introduction of instruments) and by substitution. Principle and application of the Wheatstone bridge. Principles of the simple d.c. potentiometer application to measurement of potential difference, current and resistance.
17. Elementary qualitative treatment of the theory of semiconductors: the p - n junction. Thermionic emission, the simple diode, space charge, saturation. Types of rectifiers, their characteristics and principles of operation. Single phase half-wave, full-wave and bridge connections only. Smoothing circuits. Comparison of input and output waveforms. The regulation curve protection, safety precautions.
18. The transistor, input and output characteristics, current gain in common-base and common-emitter configurations. The transistor voltage amplifier with a pure-resistance load; gain and use of load lines.
19. The thermionic triode; static characteristics and parameters and their determination. The triode voltage amplifier with a pure resistance load; gain and use of load lines.
20. Rectifier and thermocouple instruments for the measurement of current and voltage at audio and radio frequencies.
21. Principles of operation of loudspeakers, microphones and telephone receivers.

#### PART 1 (Stage R1)

#### DRAWING AND PROCESSES

Work should be done in accordance with (BS 3939) I.S.O. 4,500

1. Elements of perspective, orthographic and isometric projections.
2. Layout of drawings; production of dimension sketches from descriptions.
3. The reading of mechanical drawings and the fundamentals of first and third angle projection.
4. Understanding assembly and detailed drawings and sketches of typical items of equipment used in telecommunications, radio, television, electrical and electronic equipment.
5. Production of simple electrical layout and sequence (Schematic) diagrams, applied to electrical telecommunications, radio, television and electronic equipment using symbols specified in B.S. 3939 (Section 1, 1.1, 1.3, 1.4, 1.5.1, 1.5.2; Section 2; Section 3, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10; Section 4; Section 5; Section 6, 6.1.1, 6.1.2, 6.1.4, 6.1.5, 6.1.6, 6.9.1; Section 7, 7.1, 7.2; Section 8, 8.1; Section 9, 9.1, 9.5; Section 10, 10.1; Section 11, 11.1, 11.2, 11.5; Section 15; Section 17; Section 20, 20.2.1, 20.2.7, 20.3, 20.4, 20.5.7.

#### PROCESSES

6. The meaning of stress and strain; tensile, compressive and shear stress. Relationship between stress and strain within the elastic limit. Typical load extension graphs for ductile and brittle materials; simple physical limitations. Simple statement of Young's modulus. Meaning of safety factor.
7. Materials, properties and selection of ferrous, non-ferrous and insulating materials used in the electronics industry (including modern dielectrics).  
Note: Students should be made aware of the most important properties needed in the selection of these materials, including cost and availability.
8. Metal joining by soldering and brazing. Common brazing spelters and solders. Types of fluxes used in electrical work. Problems experienced in soldering light cables electrical and electronic devices i.e. overheating, damaging sleeving, and dry joints. Flow soldering, dip soldering and use of solder pots. Crimping, wrapping and other light cable connection methods. Termination of wires and cables.
9. Accuracy and limitation of hand processes. The use and cutting characteristics of hand tools such as files, cliseis, snips, hacksaws, in the construction of electronic equipment.
10. The application of conducting and insulating materials in the construction of cables used in electronics, cable forms. Typical wires and cables for internal and external use.
11. Common screw thread systems; use of taps and dies. Locking devices used in industry, e.g. lock nuts, spring washers. Application and construction of tag strips and terminal blocks. Simple forms of coil winding such as chokes used in electronic devices.
12. Description of typical items of telecommunications and electronic equipment; plugs, jacks, lamps, relays, keys, resistors, inductors, capacitors, and transformers. Distribution frames and protective devices. Requirements and materials for reliable electrical contact. Printed wiring. Colour coding of components.
13. Chemical effect of current; electrolytic corrosion due to (a) leakage or stray current (b) use of dissimilar metals in contact. Methods of preventing electrolytic corrosion.
14. Descriptive treatment of expansion of liquids and solids. Applications e.g. thermometers, bimetal relays, simple thermostats expansion in civil engineering structures. Definition of coefficient of linear expansion. Simple treatment of transfer of heat by conduction, convection and radiation. Practical applications such as heat sinks and cooling of equipment, material and methods used. Power rating of components; its dependence on surface area and ambient temperature.



## PART I (Stage R2)

### RADIO AND ELECTRONICS

**Note:** The treatment of this subject should be primarily descriptive of the function of the devices and not the analysis being stressed. Examples of circuits should be taken from practice circuit and function diagrams. Transistor versions should be considered in all circuits, and valves where appropriate.

1. Block diagrams of radio transmitters, radio and television receivers, digital computer systems, cathode-ray oscilloscopes and signal generators. Typical arrangements. The function of each stage.
2. The essential requirements for the transmission of information, frequency, bandwidth.
3. The use of a carrier. Amplitude modulation; modulation depth. Waveforms of a carrier, amplitude-modulated by a sinusoid. Statement of frequencies comprising the modulated waves of a carrier amplitude-modulated by (a) a sinusoid (b) a complex waveform and (c) pulses.
4. Demodulation of an amplitude-modulated wave. Circuits in common use.
5. The principles of frequency changing. Mixer circuits. Selection of i.f. advantages of superheterodyne over T.R.F. receivers.
6. Characteristics and essential features of gas filled diodes and triodes, pentodes, and field effect devices, semi-conductors diodes and transistors.
7. The amplifier. Typical requirements and frequency response. L.F. circuits including coupling, decoupling and biasing. The special requirements of wide band amplifiers. Requirements of power amplifiers, including matching and various classes of operation. Typical circuits and function of various components.
8. Descriptive treatment of use of feedback. Effect on gain, frequency response, input and output impedance, distortion and noise performance.
9. Requirements of i.f. i.f. narrow and wide band amplifiers. Typical circuits.
10. The requirements of a sinusoidal oscillator, stability, output Typical circuits emphasising the similarity of various types consisting essentially of an amplifier and feedback elements to achieve oscillation. A wide range of examples should be considered and in each case the functions of the components discussed.
11. The construction and operation of the cathode-ray tube. Electron beams under the influence of electric and magnetic fields. Simple focusing and deflection.

12. Time bases, requirements. The function of a simple circuit for achieving linear sweep in electrostatic and electromagnet tubes.
13. The use of cathode-ray tubes for picture reproduction. Explanation of terms used in T.V. systems e.g. line frequency, picture frequency, interlacing.
14. Practical power supplies, including half wave, full wave and bridge. Filter circuits. The regulation curve. Safety precautions. Protection.
15. Logical fault diagnosis. Introduction to ideas of fault location by logical testing in a simple series chain exemplified by a radio receiver. Half split method and its advantages.

### PRACTICAL WORK

Half the available time for this subject should be devoted to practical work in the optional subject of radio and electronics, which should include the following:-

16. Selection, performance, use and care of modern service test equipment. Diagnosis and correction of typical faults in simple equipment. The use of the cathode-ray oscilloscope and sweep generator. Preparations of practical test reports.
17. This practical work must be supplemented by appropriate intergrated experience in industry.

## PART 2 (Stage 1)

### MATHEMATICS

#### ALGEBRA GEOMETRY

Simplification of harder algebraic functions. The manipulation of technical formulae, including exponential and logarithmic forms. Reduction to a straight line law of variation  $y = ae^{bx}$ . (Graphical determination of the constants from given data).

Cartesian and polar co-ordinates. Conversion. Equation of a circle. Polar equations of a circle.

Complex numbers introduced as the roots of a quadratic equation and representation in the form  $a + jb$ . Graphical representation and in the form  $V/\theta$ . Addition, subtraction, multiplication, division, powers and roots of complex numbers. Application of complex numbers in simple electrical circuits.

#### DIFFERENTIATION

The derivative  $dy/dx$  as the limiting value of  $\frac{y}{x}$ . Differentiation from first principles of  $y = ax^n$ , where  $n = 1, 2, 3$  or  $-1$ .

Differentiation of  $ax^n$  by rule,  $dy/dx$  of  $y = \cos \theta$ ,  $\sin \theta$ . The graphical determination of  $dy/dt$  when  $y = \sin wt$ ,  $y = \cos wt$  ( $w$  in radians).

Rate of change, velocity and accelerations. Simple electrical applications.

Maximum and Minimum values by consideration of  $d^2y$ .

### TRIGONOMETRY

Graphs of more difficult functions e.g.  $y = A \sin \omega t$ . The compound angle formulae  $\sin(A+B)$ ,  $\cos(A+B)$ ,  $\tan(A+B)$ ; the double angle formulae  $\sin 2A$ ,  $\cos 2A$ ,  $\tan 2A$ . The half angle formulae  $\sin A$ ,  $\cos A$ ,  $\tan A$ . Addition theorems. Simple trigonometrical identities associated with the compound angle formulae. Solution of simple trigonometrical equations, including a  $\sin \theta + b \cos \theta = C$ . Approximations to ratios of small angles. Mathematical addition of sinusoidal functions of type  $a \sin \theta + b \cos \theta = r \sin(\theta + \alpha)$

### INTEGRATION

Integration as reverse process of differentiation. Integration of function of the form  $ax + b$ ,  $ax^n$ ,  $1/x$ ,  $e^{kx}$ ,  $\sin \theta$ ,  $\sin^2 \theta$ , etc. Significance of constant of integration in practical problems. The definite integral: use for determination of areas under curves and r.m.s. and average values. Comparison with results obtained by mid-ordinate rule.

### PART 2 (Stage R3)

#### ELECTRICAL PRINCIPLES

Note: This syllabus is identical with the T3 principles syllabus in the telecommunication technicians' course.

1. Capacitance. Growth and decay of voltage in resistance-capacitance circuits, without derivation of formulae. Time constant. Electrostatic shielding.
2. Inductance. Growth and decay of current in resistance-inductance circuits. Without derivation of formulae. Time constant.
3. Magnetic materials. Magnetization curves. Permeability, remanance. Coercivity. Hysteresis. Eddy currents: effect of lamination or granulation. Multipath magnetic circuits. Reluctance. Effect of air gap. Leakage Magnetic shielding.
4. The ideal transformer. Voltage ratio; current ratio on load; phasor diagram with resistive load, equivalent input resistance on load. Brief discussion of power losses in a practical transformer.
5. Impedance and admittance of circuit elements. Reactance/frequency curves for L and C; solution of series and parallel circuits containing C, L and R by phasor diagram methods and by using operator j. Power, power factor, and loss angle.

6. The utility of logarithmic units for the expression of ratios of powers, currents and voltage. Definitions of the decibel and its application to power, current and voltage ratios. Addition of gains and losses using logarithmic units.

7. Resonance in series and parallel circuits. Q-factor at resonance as  $WL$ : relationship to 3 dB bandwidth. Dynamic impedance at resonance and impedance at 3 dB points.

8. Introduction to field effect transistor. Field effect transistor characteristics and definitions of parameters. Bipolar transistors - definitions of 'h' parameters, in common base and common emitter configurations and their determination from characteristics.

9. Bipolar and field effect transistors and triode voltage amplifiers - Biasing and load line calculations. Small signal equivalent circuits. (Biasing should include discussion of need of stabilisation of bias in common emitter configuration).

10. Simple bridges at balance. Maxwell, Hay and Schering bridges only.

11. The simple a.c. generator. Simple treatment of the characteristics of separately-excited and shunt-connected d.c. generators and motors.

12. Electronic voltmeters. Measurement of power at frequencies up to 30 MHz. Calibration of instruments for measurement of current and voltage. Influence of waveform on meter accuracy. Form factor.

13. The use of cathode-ray oscilloscope for current and voltage measurements and waveform display. Explanation of limitations of use of C.R.O.

### PART II (Stage R3)

#### RADIO AND ELECTRONICS

Note: The treatment of the subject should be primarily descriptive, the function of the devices and not the analysis being stressed. Examples of circuits should be taken from practice using current circuit and function diagrams. Transistor versions should be considered in all circuits, and valves where appropriate.

1. Further work on practical low-frequency, radio-frequency and wide-band amplifiers in common use, common-anode, common-collector, common-base, common-grid, common drain and common gate circuits. Feedback applications.
2. Attenuators. II. T, ladder and m-derived filters.
3. Electron multipliers and photoelectric devices.

## PART 2 (Stage R4)

### TESTING METHODS

4. Further consideration of sinusoidal oscillators including phase shift.
5. Amplitude, frequency and pulse modulation. Frequency spectrum of the transmitted wave, single sideband operation, suppressed carrier and balanced modulator.
6. Demodulation. A.M. diode demodulators. Diode loads and their effect on video response. Filtering of i.f. and a.f. components. F.M. demodulators and limiters in common use.
7. Signal generators: specification indicating differences, types and uses.
8. Voltage doublers and multipliers, regulation. Voltage and current stabilisation using vacuum and gas-filled tubes. Zener diodes, transistors, non-linear devices and constant voltage transformers. Mains-borne interference.
9. Concept of constant current, constant voltage sources. Superposition and Thevenin's Theorems used for resolving d.c. resistive networks to the simplest equivalent forms.
10. Pulse generation and shaping circuits. Integrating and differentiating circuits.
11. Further time base circuits, including multivibrator and blocking oscillator. Requirements of electromagnetic and electrostatic deflection systems. The line output stage, automatic scan amplitude correction, 3rd harmonic tuning, S-corrector. The field output stage. Methods of obtaining linearity. Synchronisation circuits. Controls associated with time bases and their functions.
12. Consideration of integrated circuits and microminiature techniques.
13. EITHER  
Further treatment of f.m. and t.v. receivers. Second-channel interference and choice of oscillator frequency. Oscillator frequency stability. I.F. response shaping and acceptor and rejector circuits. Band pass and stagger tuning. Single sideband tuning v.h.f. and U.H.F. tuners, integrated tuner units.  
OR  
Operational amplifiers: differential amplifiers, virtual earth amplifiers, d.c. amplifiers and choppers. Stability and drift. Use of operational amplifiers in analog control and computation. Include reference to integrated circuit versions.

#### Note:

This subject stresses the philosophy of fault-finding and testing methods and is the collection of work covered in previous years.

1. The need for testing-Specifications, their purpose, types of test covered. Standards, specifications, their aims and uses. Tests to verify consistency of performance and continued satisfactory functioning. Testing of prototype, small and large batch items. The relationship between testing, inspection, quality and reliability.
2. Testing techniques. Recording, tabulation, interpretation and analysis of results. Estimate of experimental error.
3. Instruments. Review of the application and limitations of electrical indicating instruments: moving-coil, moving-iron, rectifier, and thermal, electro-dynamic, electronic voltmeter, digital display, multi-range and multi-purpose indicating instruments. Distinction between instrument types, e.g., industrial and precision, portable and switch board. Sources of error: shunts and multipliers, the effect of frequency waveform. Review of simple practices to be observed before taking reading e.g., zero-setting, instrument position, scale factors, voltmeter and wattmeter against precision grade instruments (note BSS9 recommendations). The preparation of correction graphs and calibration records.
4. Testing of a.c. and d.c. motors used for instruments and control.
5. a. the need for maintenance principles.  
b. Reliability and the connection between reliability and maintenance, meaning of mean time between failures.  
Reliability of systems.  
Quality control, acceptable variations.  
c. Component reliability, common faults and effect of environment.  
d. Factors affecting maintenance, operational requirements equipment characteristic, job environment.  
e. Preventive maintenance: routine checks and replacement of unreliable items.  
f. Corrective maintenance: Detection, location and rectification of faults. Methods of fault location: sequential and non-sequential. Random checks, half-split, beginning-to end techniques.  
8. The problem of switches and interconnections.
6. Aids to maintenance: Use of manuals, circuit diagrams, test equipment. Information retrieval. Bench layout.

7. Automatic test equipment.
8. Importance of recording and analysing results of test. Costing.
9. Production line testing techniques, standards, test gear.

#### PART II (Stage R4)

##### RADIO AND TELEVISION THEORY AND PRACTICE

**Note:** The treatment of this subject should be primarily descriptive, the function of the devices and not the analysis being stressed. Examples of circuits should be taken from practice using current circuit and function diagrams. Transistor versions should be considered in all circuits, and valves where appropriate.

1. Practical applications of aerial input circuits, bandpass filters, acceptor and rejector circuits, i.f. filters, image suppression circuits. Cross-modulation.
2. Video-frequency amplification. Frequency requirements; phase distortion. D.C. couplings and d.c. restoration. Polarity of signal fed to cathode-ray tube.
3. Operating conditions of common cathode-ray tubes. Trapezium and astigmatic distortion. Precautions in handling and operating. Causes of cathode-ray tube failure: ion burns.
4. Synchronising pulse separation. Amplitude separation of pulses from video signals and frequency separation of line and frame pulses. Separation circuits in common use. Flywheel circuits.
5. Automatic gain control: delayed and amplified systems: Tuning indicators. Interstation noise suppression. Modern automatic gain control systems for television receivers.
6. Automatic frequency control.
7. Television receiver power supply circuits. Derivation of e.h.t. from time-base fly-back voltages. Voltage multipliers. Problems of radiation and screening. A.C. and a.e./d.c. circuit techniques. Safety precautions.
8. Brief treatment of aerial and feed systems, Polarisation, Ferrite aerials. Simple dipolar and multi-arrays. Bandwidth and polar diagrams, acceptance angles. End-feed aerials. Aerials sitings. Multipath propagation. Coaxial and balanced line feeders. Matching to aerial and receiver. General properties of feeders. Standing waves. Attenuators. Use of field strength contour maps. Aerial and matching for multiband reception.
9. Chief sources of interference and methods of suppression, interference limiter circuits in common use.

10. High-fidelity receivers, pick-ups, multi-speed turntable drivers, amplifiers and loudspeakers. Stereophonic systems.
11. Audio tape: recording and reproduction. Video tape systems.
12. Dual standard techniques, reception of 625. Inter-carrier sound and 625-line i.f. response curve.
13. An introduction to stereophonic broadcasting and reception. Simple multiplex decoders.
14. Principles of colour perception, additive and subtractive colour mixing. Primary and complementary colours. Concept of luminance, hue, saturation and brightness. Simulation of high definition colour images with high resolution luminance and low resolution colour content. The relationship between the luminance signal and monochrome operation.

##### PRACTICAL WORK

15. Systematic diagnosis and correction of typical faults in f.m., video tape systems and t.v. receivers, including realignment.
16. Replacement of cathode-ray tubes, scan coils etc.
17. Installation of aerial systems and multiple aerial inter-connecting units. Distribution systems and translators.
18. Overhauls and adjustments to tape recorders and high-fidelity equipment.
19. Setting up and adjustment procedures for a shadow mask tube and colour television receiver.

#### PART II (Stage R4)

##### INDUSTRIAL ELECTRONICS THEORY AND PRACTICE

- Note:** The treatment of the subject should be primarily descriptive the function of the devices and not the analysis being stressed. Examples of circuits should be taken from practice using current circuit and function diagrams. Transistor versions should be considered in all circuits and valves where appropriate.
1. Concepts of industrial sources and application of r.f. and ultrasonic energy in electronic heating, welding and machining.
  2. Gas-filled and semi-conductor devices for power control.
  3. Binary Arithmetic; Boolean Algebra, AND, OR, NOT functions. Simple Boolean identities, truth tables. SIMPLIFICATION OF BOOLEANS ex-

pressions by use of de Morgans' theorems, VEITCH and KARNAUGH MAPS. Semiconductor diode AND, OR logic elements using both positive and negative going logic. Diode and transistor NAND and NOR logic elements (Reference to recent integrated circuits versions must be included). Counting techniques: application to binary, ring and batch counters.

#### CONTROL SYSTEMS

4. Transducers: the elementary theory, uses and systems associated with strain gauge, piezoelectric, photoelectric, inductive, potentiometric and capacitive transducers.
5. Thermo-couples and thermistors.
6. Servometers; introduction to the principles and characteristics of d.c. motors and 2-and 3-phase induction motors.
7. Tacho-generators.
8. Synchro devices.
9. Electromechanical devices used with control systems: a.c. and d.c. solenoids and clutches, relays, uniselectors, microswitches, contactors, bimetal thermostats.
10. Automatic inspection, sorting and counting systems. Automatic machine control including pneumatic and hydraulic systems.
11. Electronic safety devices.
12. Principles of linear servo control systems: definition of and need for three-term control.
13. Practical application of proportional integral and derivative actions in power control.
14. Phase-sensitive circuit techniques as applied to modulation, demodulation and amplification for servo systems.
15. Simple treatment of potentiometric recorders.
16. Elements of digital control. Outline of data storage and transmission systems.
17. Fluidics.

#### PART III

##### WIRED AND CLOSED-CIRCUIT TELEVISION SYSTEMS

1. General: general review of systems in use i.e. video, m.f. v.h.f. and u.h.f.
2. Video: simple closed circuit system of camera and receiver or v.t.v. and receiver. Limitations. Multi-channel requirements.
3. Regulations: regulations covering relay operators' licence and technical performance.
4. Broadcast channels: tete beche principles and carrier frequencies, bandwidths on systems, crossview and patterning, common carrier and other systems. A.G.C. methods including pilot carrier, Planning considerations and economics.
5. Frequency slope: slope of transmission relative to carrier, equalising requirements, use of pre-emphasis 625, and colour de-emphasis.
6. Receivers: difference between wired and aerial input receivers. Signal and amplifiers. Demodulators (full-wave type) carrier break-through and rejector circuits, S.F. de-emphasis. Provision receivers a.m./h.f. (radio) and u.h.f.
7. Cables: cable types, attenuation characteristics.
8. Connections to vision cables: subscriber inserts, spur inlets, bridging and matching spur and feeder losses, effects of mis-match.
9. Repeaters: block diagrams of vision trunk repeaters (coaxial and quad). Sound/vision combiners. Baluns splitters, pre-emphasis units, attenuators. Operating levels.
10. Aerial site equipment: frequency converters, demodulators, carrier locking equipment. Superhet principle of modulation.
11. Aerials: aerial theory particularly dealing with choice of aerials in difficult signal conditions. Complex arrays. Selection of aerials and sites. This is to include aerials for v.h.f. and u.h.f.
12. Signal sources: types of camera, selection for particular applications. Introduction to video tape and other recording methods. General studio equipment for colour and monochrome. Telecine equipment.
13. Measurements: use of pulse and bar measuring techniques in measuring systems and equipment performance. Measurement of frequency/amplitude response, intermodulation etc. on system and equipment.

PART 3  
F.M. AND MULTIPLEX STEREO

F.M. AND MULTIPLEX STEREO

1. General principles: propagation characteristics at v.h.f. channel allocation and spacing. Principles of frequency modulation. Effect of modulation frequency, amplitude and waveshape on the f.m. carrier, phasor representation of amplitude modulated wave and frequency modulated wave sidebands, effect on sidebands of variation of modulation. Amplitude and frequency. Signal-to-noise ratio, pre-emphasis, dynamic range. Adjacent-channel interference and capture effect.
2. Generation of f.m. signals: methods of producing frequency modulated signals, carrier stability. Variable reactance modulators. Saturable reactor frequency modulation. Use of variable capacitance diodes.
3. Reception of f.m. signals: aerials for v.h.f. multipath effect. Image and other spurious responses, cross modulation. Demodulation of f.m. signals, Foster Seeley ratio detector etc., limiters, commercial circuits in common use, intercarrier sound and reasons for use in television. Methods of alignment of f.m. equipment: Performance measurements. Oscillator stability, Requirements of the r.f. and frequency changing stages.
4. Stereophonic broadcasting: the multiplex principle. The Zenith G.E. systems of transmission. Frequency spectrum of the multiplex modulation waveform. Decoding methods for multiplex signals. Practical multiplex compatibility stereo indicators, commercial circuits.

PART 3  
COLOUR TELEVISION

COLOUR TELEVISION

1. Revision of monochrome systems and standards as appropriate.
2. Revision of principles of colour perception: nature of light. Colour perception and limitations of the human eye. Luminance, hue, saturation and brightness. Additive and subtractive colour mixing. Filters and dichroic mirrors. Primary and complementary colours. Chromaticity diagrams. Simulation of high definition colour images with low resolution colour and high resolution luminance content.
3. Colour camera: principles of sequential and simultaneous systems, R.G. and B. signals, Gamma correction of colour signals. The luminance signal. Three and four tube camera systems.

COLOUR TELEVISION SIGNAL

4. Block diagram of transmitter encoding. Compatibility and reverse compatibility. The luminance signal. Luminance signal matrixing. Colour difference signals and their merits. Constant luminance. Weighting of colour difference signals. Signal band width and luminance delay.

5. Further work on suppressed carrier modulation. Use of subcarrier. Choice of subcarrier frequency to minimise patterning (half and quarter line off-set 25 Hz off-set). Frequency interleaving. Quadrature modulation with suppressed carrier U and V modulation axes.
6. Calculation and graphical representation of luminance and colour difference signal amplitudes (including G-Y). Sub-carrier phase angles, amplitudes and composite signal values for the 100% Saturation, 100% amplitude colour bar signal. Examination of the 95% Saturation, full amplitude colour bar signal. The colour signal equation.
7. V signal phase commutation. Phase error cancellation in delay PAL operation and its effects. Phase error in simple PAL operation and its effects.
8. The function of burst. Burst phase alternation and V switch synchronism.

RECEPTION

9. Signal requirements and effects of propagation errors. I.F. amplifier response and subcarrier beat problems. Demodulation. Separation of luminance and chrominance signals. Luminance chrominance ratio at the demodulator. Luminance amplification and delay. Retrace blanking.
10. D.C. component and maintenance of white balance. Grey scale tracking arrangements. Use of c.r.t. as a matrix. R.G.B. matrix and amplification. Brightness control and beam current limiting. Retrace blanking.
11. Chroma amplification. Burst blanking. Saturation control. Automatic chrominance control. The long period delay line. Phase error cancellation and U and V separation. Demodulation of suppressed carrier signals.
12. The reference generator. Automatic phase control. Burst gating circuits. Identification signal. Other V signal and V reference switching. Bistable multivibrator as V signal switch drive. Other V signal switch drive arrangements. 90° phase shift networks. Colour killer. Derivation of (G-Y). (G-Y) matrix circuits. Colour difference amplifiers. De-weighting. Driven clamps.

PART 3

ELECTRONIC SUPERVISORY AND INDICATION SYSTEMS

DATA TRANSMISSION

1. A.M. and f.m. transmission of digital information, relative merits and security against noise. Bandwidth requirements of different systems and associated carrier frequencies, CCITT requirements. Line protection, requirement of Post Office and other authorities.
2. Use of radio, land line and power line carrier as bearer channels. Four and two wire working. Use of hybrids for line matching.

### PART 3

#### MICROELECTRONIC AND SEMICONDUCTOR TECHNOLOGY

This syllabus covers the application of integrated circuits and associated semi-conductor devices, but not the detailed circuitry within such devices.

1. Advantages and disadvantages of integrated circuit and micro-electronic devices compared with those of circuits using discrete components, including considerations of electrical performance and economics. Reliability: mean time between failures in relation to degree of integration in complex systems.
2. Basic semiconductor theory: revision of basic principles, energy bands, carrier mobilities.
3. Methods of construction and packaging of thin and thick-film devices, monolithic devices and microelectronic modules. Applications of each technique.
4. Integrated circuit applications: characteristics and performance specifications of logic and counting circuits, multiple gates, differential amplifiers and integrated operational amplifiers. Mounting techniques and method of connection to external circuits. Precautions necessary in the external circuitry.
5. Use of integrated circuits in instruments such as electronic voltmeters, digital display meters, counters and calculating machines. (Interconnection of block diagrams rather than detailed circuitry.) Consideration of the use of integrated circuits in the industrial and consumer fields.
6. Characteristics and uses of field-effect transistors, metal oxide silicon transistors (m.o.s.i.'s), diacs, triacs and the unijunction transistor. Field effect mobility, simple equations (without proof) for the m.o.s.i., the m.o.s.t. as a resistor, simple typical circuits.
7. Methods of testing and fault location, in and repair of, equipment using the above devices.

3. Use of speech circuits for combined speech and signalling working. High-pass and low pass filters.

4. Protective codes, use of parity bits. Carrier detector circuits. Data transmission circuits operating as radial or party line systems.

#### CONTROL AND INDICATION TECHNIQUES

5. Direct wire systems.
6. Systems employing digital techniques. System security, use of single-state and two-state systems of control, including selection and check-back technique. Fail-safe techniques, word structure, use of station and word address with parity. Broadcast and set-point controls.

#### TRANSMISSION OF ANALOG QUANTITIES

7. Transducers associated with remote indication systems - for example measurements of voltage, current, power, pressure level, temperature etc. including torque balance converter. Analog-to-digital converters: ramp and weighing types. Factors affecting resolution and accuracy. Binary coded decimal and binary codes for transmission.

8. Digital-to-Analog conversion; meter and digital displays.

#### INDICATIONS

9. Alarms. Fleeting and non-fleeting types. Reset technique of fleeting alarms.

#### DISPLAY

10. Full display systems. Common diagram working. Discrepancy key. Illuminated push buttons. Need for and method of applying lamp test. Flashing and audible alarm techniques.

#### INTERFACES

11. Electrical isolation of control equipment. Use of relays, solid-state and a.c. coupled devices. Interposing relays. Particular requirements of electricity, gas, water and oil industries. Control systems requiring computer interface.

#### LOGGING

12. Use of strip and page printers. Storage systems for use with logging. Magnetic drum, disc, core store, relay, solid state etc. Automatic and on-demand systems.

THE NUMBER OF TRAINEES FOR FULL FORMAL VOCATIONAL TRAINING COURSE  
AND ON-THE-JOB TRAINING

UNIT COURSES	1981	1982	1983	1984
<b>MOBASA V.T. UNIT</b>				
(i) Carpentry	64	66	66	69
(ii) Masonry	60	66	72	71
(iii) Motor V. Mechanics	65	72	72	74
(iv) Turning	39	39	39	40
(v) Fitting	60	66	72	72
(vi) Electrical Wiring	54	60	60	65
(vii) Welding	6	20	23	24
(viii) Plumbing	8	12	16	40
(ix) Motor V. Electrician	-	-	16	40
<b>Total</b>	<b>357</b>	<b>399</b>	<b>422</b>	<b>476</b>
<b>NAIROBI HOLDING UNIT</b>				
<b>(a) Advanced Eng. School</b>				
(i) Fitting	32	39	47	50
(ii) Turning	29	29	28	28
(iii) Electrical Wiring	33	38	43	45
<b>Total</b>	<b>94</b>	<b>106</b>	<b>118</b>	<b>128</b>
<b>(b) Advanced M.V.M./ M.V.E. School</b>				
(i) Motor V. Mechanics	48	71	120	64
(ii) Motor V. Electrician	16	18	13	45
<b>Total</b>	<b>64</b>	<b>89</b>	<b>133</b>	<b>109</b>
(c) Secretarial School:	93	189	159	141
(d) Upholstery School:	20	56	32	37
(e) Driving School:	225	150	81	150
<b>GILGIL TRAINING UNIT</b>				
<b>(a) Tailoring/Dressmaking School</b>				
	287	300	320	320
<b>(b) Advanced Building Trades</b>				
(i) Carpentry	-	-	15	30
(ii) Masonry	-	-	15	30
(iii) Plumbing	-	-	90	20
<b>TURBO FIELD UNIT</b>				
Rural Craft Training Unit	90	90	108	120
<b>PLANT OPERATORS/MECHANICS SCHOOL</b>				
	1981	1982	1983	1984
Plant Operators	-	-	30	60
Plant Mechanics	-	-	30	60
<b>ON-THE-JOB TRAINING</b>				
All Trades	500	504	490	320
<b>APPRENTICESHIP TRAINING</b>				
All trades	-	-	-	216



TRAINEES STATISTICS  
1976 - 1980

TRADE	YEAR	NO.	PASS	%PASS	T/TRADE	AVE. %PASS
CARPENTRY	1976	60	39	65%	294	75%
	1977	58	43	74%		
	1978	61	44	72%		
	1979	57	50	88%		
	1980	58	45	78%		
MASON	1976	60	56	93%	298	93%
	1977	60	57	95%		
	1978	59	54	92%		
	1979	59	52	88%		
	1980	60	59	98%		
M.V.M.	1976	63	37	59%	296	76%
	1977	59	49	83%		
	1978	60	50	83%		
	1979	60	44	73%		
	1980	54	44	81%		
TURNING	1976	16	10	63%	119	73%
	1977	19	19	100%		
	1978	20	15	75%		
	1979	31	17	55%		
	1980	33	23	70%		
FITTING	1976	17	16	94%	114	85%
	1977	17	16	94%		
	1978	20	16	80%		
	1979	30	21	70%		
	1980	30	26	87%		
ELECTRICAL	1976	46	33	72%	239	81%
	1977	47	39	83%		
	1978	47	39	83%		
	1979	47	40	85%		
	1980	52	43	83%		
WELDING	1976	4	0	0%	28	73%
	1977	4	3	75%		
	1978	4	4	100%		
	1979	11	10	91%		
	1980	5	5	100%		
PLUMBING	1976	3	2	67%	20	63%
	1977	4	3	75%		
	1978	3	2	67%		
	1979	4	3	75%		
	1980	6	2	33%		

TRAINEES STATISTICS  
1981 to 1984

ADVANCED ENGINEERING SCHOOL

		<u>No.</u>	<u>PASS</u>
1981	Fitting	32	29
	Turning	29	26
	Electrical Wiring	33	32
1982	Fitting	39	38
	Turning	29	26
	Electrical Wiring	38	36
1983	Fitting	47	40
	Turning	28	26
	Electrical Wiring	43	41
1984	Fitting	50	46
	Turning	28	25
	Electrical Wiring	45	43

ADVANCED MECHANICS SCHOOL

1981	M.V.M.	48	40
	M.V.B.	16	16
1982	M.V.M.	71	63
	M.V.E.	18	15
1983	M.V.M.	80	67
	M.V.E.	13	10
1984	M.V.M.	64	59
		45	43

LAWS OF KENYA

The National Youth Service Act

CHAPTER 208

CHAPTER 208

THE NATIONAL YOUTH SERVICE ACT

ARRANGEMENT OF SECTIONS

PRELIMINARY

Section

- 1—Short title.
- 2—Interpretation.
- 3—Establishment of National Youth Service.
- 4—Appointment of National Youth Leader.

ORGANIZATION AND MEMBERSHIP OF THE SERVICE

- 5—Members of Service.
- 6—Secondment to Service.
- 7—Appointment to, or enlistment in, Service.
- 8—Termination of service.
- 9—Resignation from Service.
- 10—Extension of service during times of emergency.
- 11—Return of service property.
- 12—Members not to engage in trade, etc.
- 13—Service may be divided into branches, etc.
- 14—Responsibilities of Director and officers in charge.

DUTIES AND EMPLOYMENT OF THE SERVICE

- 15—Duties of members.
- 16—Functions of Service.
- 17—Employment of Service in times of emergency.

DISCIPLINE

- 18—Disciplinary Code and Regulations.
- 19—Mutiny.
- 20—Insubordinate behaviour.
- 21—Liability for other offences.
- 22—Desertion.

REGULATIONS

- 23—Minister may make regulations.

MISCELLANEOUS

- 24—Causing disaffection, etc.
- 25—Unlawful possession of articles supplied to members.
- 28—Finance.
- 29—Member declared to be workman.
- 30—Prohibition against members being members of trade union.

SCHEDULE

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CHAPTER 208

THE NATIONAL YOUTH SERVICE ACT

Commencement: 1st September 1964

An Act of Parliament to provide for the establishment of a National Youth Service and for matters connected therewith and incidental thereto

Appointment of National Youth Leader, 21 of 1966, Sch. 21 of 1966.

4. (1) There shall be a National Youth Leader appointed by the President, acting on the advice of the Minister, and for the avoidance of doubt it is hereby declared that, for the purposes of section 41 (1) (f) of the Constitution, the office of National Youth Leader is not a public office.

(2) The duties of the National Youth Leader shall be to advise the Minister on the exercise of his powers under this Act and his general responsibilities for the Service.

(3) The National Youth Leader shall be appointed from amongst the members of the National Assembly.

PRELIMINARY

1. ... This Act may be cited as the National Youth Service Act.

2. In this Act, except where the context otherwise requires—

"Director" means the Director of the National Youth Service appointed under this Act;

"gazetted officer" means a member of the Service of one of the ranks of gazetted officer specified in the First Schedule to this Act;

"member" in relation to the Service includes a gazetted officer, a subordinate officer, an under officer, and a serviceman, and includes any person for the time being seconded for service in the Service;

"Minister" means the Minister for the time being responsible for the Service;

"the Service" means the National Youth Service established by section 3 of this Act;

"serviceman" means a member of the Service other than a gazetted officer, a subordinate officer, an under officer or any person seconded for service in the Service;

"subordinate officer" means a member of the Service of one of the ranks of subordinate officer specified in the First Schedule to this Act;

"under officer" means a member of the Service of one of the ranks of under officer specified in the First Schedule to this Act.

3. There shall be established and maintained the National Youth Service.

Members of Service.

ORGANIZATION AND MEMBERSHIP OF THE SERVICE

5. (1) The Service shall consist of such number of members as may, from time to time, by notice in the Gazette, be prescribed by the Minister."

(2) The members of the Service shall be either servicemen or officers, such officers being gazetted officers, subordinate officers or under officers having the ranks and seniorities specified in the First Schedule to this Act.

(3) The Minister may, from time to time, by notice in the Gazette, amend the First Schedule to this Act.

Secondment to Service.

6. Any person in the civil or military service of Kenya, or any adviser or officer from any other country by arrangement with the Government, may be seconded by the Minister for service with the Service, for such period and at such rank in the Service as the Minister may approve:

Provided that where a person is seconded to the Service in any particular rank he shall not thereafter be required to serve in any rank junior thereto without his consent, and if he can no longer be employed in the rank at which he was seconded, or in any rank senior thereto, his secondment shall, if he so wishes, be terminated.

Appointment to, or enlistment in, Service.

7. (1) Gazetted officers and subordinate officers shall be appointed in the manner applicable to the appointment of other public officers.

(2) (a) Other members of the Service, who must be male or female citizens of Kenya between the ages of sixteen years and thirty years (both ages being inclusive), may be enlisted or re-enlisted by the Director, or by a gazetted officer authorized by him in that behalf, from persons who voluntarily offer themselves for enlistment or re-enlistment.

(b) Every member of the Service enlisted or re-enlisted under paragraph (a) of this subsection shall be enlisted initially to serve in the Service for a period of one year, or for such other period as the Minister\* may, from time to time, by notice in the Gazette prescribe, and on the expiration of such period may, if he so wishes and the Director, or a gazetted officer authorized by him in that behalf so approves, be re-enlisted for a further period:

Provided that a member desiring to re-enlist for a further term of service shall so apply not more than three months, or less than one month, immediately preceding the date of expiration of his current period of service.

(3) Every member of the Service being appointed or seconded or enlisted for the first time shall be required to make the declaration set out in the Second Schedule to this Act, either in English or in some other language that he understands.

8. (1) The Minister\* may at any time during the period of secondment of a member terminate such secondment if, for any reason, the services of such member are no longer required.

(2) The appointment of a gazetted officer or a subordinate officer may be terminated, if his services are no longer required, in the manner applicable to other public officers.

Termination  
of service.

(3) The Director may, at any time during the period of enlistment or re-enlistment of an under officer or serviceman, terminate such enlistment or re-enlistment if for any reason the under officer's or serviceman's services are no longer required.

9. (1) An under officer or a serviceman may, at the discretion of the Director, or a gazetted officer authorized by him in that behalf, be permitted to resign from the Service before the expiration of his period of enlistment or re-enlistment on personal or compassionate grounds.

Resignation from  
Service

(2) A gazetted officer or a subordinate officer may be permitted to resign from the Service in the manner applicable to other public officers.

10. Notwithstanding the foregoing provisions of this Act, any member of the Service whose engagement or secondment expires, or who wishes to resign, during a state of war, insurrection, hostilities or public emergency may be retained in the Service and his period of engagement or secondment prolonged for such further period, not being more than six months after the ending of such date, as the Minister\* directs:

Extension of  
service during  
times of  
emergency.

Provided that this section shall not apply to a member seconded from another country, except with the consent of the government of the other country concerned and of the member concerned.

11. (1) Every member on leaving the Service shall forthwith deliver up to such person as may be authorized in that behalf, any uniform, clothing, equipment or accoutrements supplied to him by or on behalf of the Service:

Return of  
service  
property.

Provided that the Director, at his discretion, may authorize a member to retain items of clothing on leaving the Service.

(2) Any person who fails to comply with subsection (1) of this section, or who returns such property in a damaged condition, the damage not being attributable to the proper discharge of his duties whilst a member of the Service, shall be liable for the cost of replacing or repairing such property, and such cost shall be a debt due from such person to the Government and may be recoverable by deduction from any moneys due from the Government to such person, or by civil suit for the whole amount, or for any balance due after such deduction as aforesaid.

12. During his period of service with the Service no member shall engage himself in any trade, business or employment, or shall take part in any commercial or agricultural undertaking, outside the scope of his duties in the Service, except with the approval of the Minister\* in the case of a gazetted officer, or the Director in the case of any other member.

Members not  
to engage in  
trade, etc.

13. (1) The Service shall be divided into such numbers and description of branches, units and sub-units as the Minister\* may, from time to time, by notice in the Gazette direct.

Service may  
be divided  
into branches,  
etc.

(2) Any member save an officer specifically seconded for a particular description of branch, unit or sub-unit (who may be posted only to a branch, unit or sub-unit of that description), may at the discretion of the Director be posted to and employed in any branch, unit or sub-unit of the Service.

14. (1) The Director shall, subject to this Act and any subsidiary legislation made thereunder, and any directions given by the Minister\*, be responsible for the overall command, superintendence and direction of the Service, and may

Responsibilities  
of Director  
and officers  
in charge.

for this purpose from time to time issue Service Standing Orders (which shall not be required to be published in the Gazette).

(2) Subject to subsection (1) of this section, the member who is appointed as officer in charge of any description of branch, unit or sub-unit or combination of the same shall be responsible for the command, superintendence and direction of such branch, unit or sub-unit or such combination.

(3) The Director may, subject to this Act and any subsidiary legislation made thereunder, make such appointments or promotions to the ranks of under officer as he deems fit.

#### DUTIES AND EMPLOYMENT OF THE SERVICE

15. Every member of the Service shall—

(a) perform such duties and carry out such training as he may be directed by the officers senior to him or placed in command over him;

(b) obey and execute promptly all orders lawfully issued to him by the officers senior to him or placed in command over him.

16. The functions of the Service shall be the training of young citizens to serve the nation, and the employment of its members in tasks of national importance and otherwise in the service of the nation.

17. (1) The President may, during a state of war, insurrection, hostilities or public emergency, order that the Service or any part thereof be employed to serve with the armed forces, or otherwise in the defence of the nation, whether within or outside Kenya.

(2) Where any part of the Service is, in pursuance of an order made under subsection (1) of this section, serving with the armed forces, or otherwise in the defence of the nation whether within or outside Kenya, such part of the Service shall for all purposes be deemed to be part of the armed forces, and it shall be governed by and subject to all the laws relating to and governing the armed forces in all respects as if such part of the Service were part of the armed forces.

(3) Where any part of the Service is, in pursuance of an order made under subsection (1) of this section, serving with and as part of the armed forces, the Minister for the time

Duties of members.

Functions of Service.

Employment of Service in times of emergency.

being responsible for defence shall make rules declaring which ranks of the Service shall correspond to which ranks of the armed forces, and shall make rules relating to the command of such part of the Service by members of the armed forces.

#### DISCIPLINE

18. (1) The Director may issue a disciplinary code for the Service or any part of the Service, and in respect of under officers and servicemen may make regulations for the following matters—

(a) to make provision for the investigation of disciplinary offences and the hearing and determination of disciplinary proceedings;

(b) to make provision for appeals; and

(c) to prescribe disciplinary penalties and awards.

(2) The following disciplinary penalties and awards, or any combination thereof, may be included in such regulations for infringements of the disciplinary code—

(a) dismissal from the Service;

(b) reduction in rank;

(c) confinement in a guard room, or restriction to the confines of any camp or other area where a part of the Service is stationed, for not more than fourteen days;

(d) fines;

(e) stoppages of pay or allowances;

(f) extra drills or parades or fatigues.

(3) Regulations issued under this section may provide that any member committing a disciplinary offence may be arrested without warrant by or on the order of an officer senior to himself or placed in command over him, and taken without delay before a gazetted officer, who may, if the circumstances so warrant, confine such member or cause such member to be confined in any building suitable for the purpose, pending the determination of disciplinary proceedings.

(4) A person seconded to the Service from another country shall not be subject to the disciplinary code.

19. (1) Any member who takes part in a mutiny shall be guilty of an offence and shall be liable to imprisonment for a term not exceeding five years.

Disciplinary Code and Regulations.

Mutiny.

(2) In subsection (1) of this section, "mutiny" means a combination between two or more members, or between persons, at least two of whom are members—  
 (a) to overthrow or resist lawful authority in the Service; or  
 (b) to disobey any such authority in such circumstances as to make the disobedience subversive of discipline.

20. Any member who—  
 (a) strikes or otherwise uses violence to, or offers violence to or incites any other person to use violence to, an officer senior to or placed in command over him or such other person; or  
 (b) uses threatening or insubordinate language to any officer senior to or placed in command over him, shall be guilty of an offence and shall be liable to imprisonment for a term not exceeding one year.

21. Nothing in this Act or in the disciplinary code shall exempt any member from being proceeded against for any offence under any other written law.

22. (1) Any member who absents himself from duty without leave or just cause for a period of twenty-one days shall, unless the contrary be proved, be deemed to have deserted from the Service.

(2) Any member who deserts from the Service shall forfeit any pay or allowances due to him, and all rights in respect of any savings scheme operated by the Service.

(3) No pay or allowances shall be paid to any member in respect of any day during which he is absent from duty without leave, unless the Director otherwise directs.

REGULATIONS

23. In addition to the powers to make regulations or orders provided in the foregoing provisions of this Act, the Minister may make regulations generally for the better carrying out of the purposes of this Act.

MISCELLANEOUS

24. Any person who—  
 (a) causes, or utters, prints or publishes any words or does any act calculated to cause, disaffection amongst members, or

Insubordinate behaviour.

Liability for other offences.

Desertion.

Minister may make regulations.

Causing disaffection, etc.

(b) induces, or utters, prints or publishes any words, or does, any act calculated to induce, any member to desert or commit any offence under this Act or any subsidiary legislation made thereunder or under the disciplinary code,

shall be guilty of an offence and liable to imprisonment for a term not exceeding two years.

25. (1) Any person, not being a member, or who has ceased to be a member, who is found in possession of any article whatsoever which has been supplied to a member, or is intended for supply to a member for use in the execution of his duty, and who fails to account satisfactorily for his lawful possession thereof, shall be guilty of an offence and liable to imprisonment for a term not exceeding six months.

(2) Any person who, without lawful authority—  
 (a) sells or otherwise disposes of, or purchases or otherwise acquires, any article whatsoever which has been supplied to, or is intended for supply to, a member for use in the execution of his duty; or

(b) aids and abets any person in selling, disposing of, purchasing or acquiring any such article,

shall be guilty of an offence and shall be liable to imprisonment for a term not exceeding six months.

26. [Spent.]

27. [Spent.]

28. The expenditure incurred in the establishment, maintenance and operation of the Service, including the payment of such allowances for members as the Minister may from time to time direct shall be defrayed out of moneys provided by Parliament.

29. Notwithstanding anything contained in any other written law, a member of the Service shall be deemed to be a workman, and the Government shall be deemed to be his employer, for the purposes of the Workmen's Compensation Act.

30. (1) It shall not be lawful for any member of the Service to be or to become a member of—

(a) any trade union, or any body or association affiliated to a trade union; or

Unlawful possession of articles supplied to members.

Finance.

Member declared to be workman.

Cap. 236.

Prohibition against members belonging to trade union.

(b) any body or association the objects, or one of the objects, of which is to control or influence conditions of employment in any trade or profession; or

(c) any body or association the objects, or one of the objects, of which is to control or influence the pay, allowances or conditions of service of the Service.

(2) Any member of the Service who contravenes this section shall be liable to be dismissed from the Service and to forfeit any pay or allowances due to him and all rights in respect of any savings scheme operated by the Service.

(3) If any question arises as to whether any body is a trade union, or body or association to which this section applies, the question shall be referred to the Minister, whose decision thereon shall be final and shall not be questioned in any court.

FIRST SCHEDULE (s. 5 (2))

RANKS OF OFFICERS OF THE SERVICE IN ORDER OF SENIORITY

*Cazetted Officers*

- Director.
- Deputy Director.
- Assistant Director.
- Unit Commandant.
- Senior Training Officer.
- Training Officer.
- Assistant Training Officer.

*Subordinate Officers*

- Section Commander.
- Section Officer Grade I.
- Section Officer Grade II.

*Under Officers*

- Sergeant.
- Corporal.
- Lance-Corporal.

SECOND SCHEDULE (s. 7 (3))

THE NATIONAL YOUTH SERVICE ACT

DECLARATION

I ..... do hereby swear by Almighty God [or do hereby solemnly and sincerely affirm] that I will give faithful and loyal service during this or any subsequent period of service as a member of the National Youth Service of Kenya, and that I will subject myself to all Acts, Subsidiary Legislation and Standing Orders and the disciplinary code relating to the said Service which may from time to time be in force.

.....  
Signature or thumb-print of member

Declared by the said

.....  
after the same had been read over

and explained to him in the .....

language, which he appeared to

understand, at .....

this ..... day of .....

19.....

Before me.

\*Powers of Minister delegated to the Permanent Secretary of the Ministry by L.N. 290/1965.



[Subsidiary]

**SUBSIDIARY LEGISLATION.**

Units and Sub-units into which the Service has been divided under section 13 (1)

*Units*

The Nairobi Training Unit.  
The Mombasa Field Unit.  
The Gilgil Field Unit.  
The Yatta Field Unit.

L.N. 317/1965.

*Sub-units*

Tumaini Harambee Farm, Ol Kalou.  
Waterfalls Harambee Farm, Yatta.  
Donyo Sabuk Project Unit, Yatta.  
Shimba Hills Project Unit.  
Tsavo Park East Project Unit, Voi.  
North Kinangop Project Unit.  
Karuru Forest Project Unit.  
Gatundu-South Kinangop Project Unit.  
Yala River Project Unit.

Number of members prescribed under section 5 (1)

The number of members of the Service shall not exceed seven thousand.

L.N. 319/1965.

Period of initial enlistment prescribed under section 7 (2) (b)

Ten years.

L.N. 318/1965.

Regulations under section 18

**THE NATIONAL YOUTH SERVICE REGULATIONS**

L.N. 234/1966.

1. These Regulations may be cited as the National Youth Service Regulations.

2. In these Regulations—

"accused person" means an under officer or serviceman accused of an offence against discipline;

"inquiry" means an inquiry into an alleged offence against discipline.

3. Any member, other than a person seconded to the Service from another country, who—

(1) strikes or otherwise uses violence to, or offers violence to, or utters to violence to, any other member; or

(2) uses any obscene, abusive or insulting language to any other member; or

(3) causes a disturbance in any Service barracks, quarters, lines or camp; or

(4) is guilty of drunkenness; or

(5) drinks intoxicating liquor when on duty; or

[Subsidiary]

(6) is disrespectful in word, act or demeanour to any gazetted officer or subordinate officer who is senior to him in rank; or

(7) wilfully disobeys any lawful command; or

(8) absents himself without leave; or

(9) is found sleeping on duty; or

(10) leaves his post or place of duty before he is regularly relieved; or

(11) being under arrest or in confinement, leaves or escapes from such arrest or confinement before he is set at liberty by proper authority; or

(12) without lawful excuse, breaks out of Service barracks, quarters, lines or camp; or

(13) neglects or refuses to assist in the arrest of any under officer or serviceman whom he has been lawfully ordered to arrest; or

(14) resists any member whose duty it is to arrest him or have him in charge; or

(15) unlawfully strikes any person or otherwise uses violence or offers unlawful violence to any other person; or

(16) without reasonable cause, fails to attend at any parade, instruction class, working party or any other duty which he is required to attend; or

(17) commits any plunder or wanton destruction of property; or

(18) is idle and negligent in the performance of his duty; or

(19) appears on any duty untidy or dirty in his person, clothing or equipment; or

(20) is slovenly, inattentive, uncivil or quarrelsome; or

(21) makes or signs any false statement in any document or official record; or

(22) makes, or joins in making, any anonymous complaint; or

(23) without proper authority, discloses or conveys any information concerning Service matters to any person not a member officially entitled to receive such information; or

(24) malingers, or feigns any disease or infirmity, or wilfully causes to himself any disease or infirmity; or

(25) is wilfully guilty of misconduct or wilfully disobeys, whether in hospital or elsewhere, any orders and so causes or aggravates any disease or infirmity or delays its cure; or

(26) contracts any venereal disease and fails to report without delay to a medical officer for treatment; or

(27) makes a statement which is false in any material particular on joining the Service; or

(28) refuses or neglects to make or send any report or return which it is his duty to make or send; or

(29) wilfully makes any false accusation against any other member or other person; or

(30) in making a complaint against any other member or other person, wilfully makes a false statement affecting the character of such member or other person or wilfully suppresses any material fact; or

[Subsidiary]

- (31) engages without authority in any other employment, office or business undertaking; or
- (32) becomes security for any person, or engages in any loan transaction with any other member, without the authority in writing of the Director; or
- (33) sells, pawns, loses by neglect, makes away with, wilfully or negligently damages or fails to report any loss or damage to any accountment, uniform or other article of personal issue or any vehicle or other property committed to his charge belonging to the Government or for which the Government is responsible; or
- (34) permits an unauthorized person to enter any Service barracks, quarters, lines or camp; or
- (35) is guilty of any act, conduct, disorder or neglect to the prejudice of good order and discipline, not hereinbefore specified.

shall be guilty of an offence against discipline.

4. Every member, other than an under officer, a serviceman or a person seconded to the Service from another country, shall be subject to the like regulations as are applicable to public officers, so far as the same are not inconsistent with any regulations made under the Act as far as the same may be applicable.

5. Any member of the Service, other than a person seconded to the Service from another country, who commits one of the offences against discipline specified in regulation 3. of these Regulations may be arrested without warrant by or on the order of an officer senior to himself or placed in command over him and taken without delay before a gazetted officer, who may, if the circumstances so warrant, confine such member or cause such member to be confined in any building suitable for the purpose, pending the determination of disciplinary proceedings.

6. (1) The Director, or any gazetted officer, or the officer in charge of the branch, unit or sub-unit or combination of the same, may inquire into the truth of any charge under regulation 3 of these Regulations brought against an under officer or serviceman, and if he finds the accused person guilty of the charge he shall convict him and may award any one or more of the following punishments—

- (a) warning;
- (b) reprimand;
- (c) extra drills or parades or fatigues;
- (d) confinement in a guard room or restriction to the confines of any camp or other area where a part of the Service is stationed, for not more than fourteen days;
- (e) fine, not exceeding one-half of one month's pay and allowances;
- (f) reduction in rank;
- (g) dismissal from the Service;
- (h) in case of a charge relating to damage or loss of Government property, payment of the value of the property damaged or lost.
- (i) stoppage of pay or allowances.

[Subsidiary]

(2) Any punishment imposed by a gazetted officer or officer in charge under one of the subparagraphs (c), (f), (g) and (h) of paragraph (1) of this regulation shall be subject to confirmation by the Director.

(3) Whether any punishment imposed by a gazetted officer or an officer in charge under this regulation requires the confirmation of the Director or not, the Director may enhance, vary or remit any punishment so imposed:

Provided that—

(i) no punishment shall be enhanced unless the accused person has been given an opportunity of being heard by the Director, or by a gazetted officer or a subordinate officer nominated for that purpose by the Director, and

(ii) no punishment may be awarded beyond that prescribed by this regulation.

(4) (a) Any punishment of a kind described in paragraph (2) of this regulation may be suspended by the Director for such period, not exceeding six months, as the Director may determine.

(b) Where any punishment has been suspended in this way, the Director shall at the expiration of the period of suspension review the case, and may thereupon order the punishment to be remitted or reduced, in which case he shall cause any entry relating to the offence which has been made in the records of the offender to be expunged or altered, as the case may be, or he may order the punishment to be forthwith carried into execution.

(c) If during the period of suspension the offender is convicted of a further offence against discipline, the suspended punishment shall forthwith be carried into execution.

7. (1) Any under officer or serviceman who has been convicted of an offence against discipline by a gazetted officer or an officer in charge may within fourteen days of such conviction appeal to the Director against the conviction or against the punishment or against both the conviction and the punishment.

(2) The Director on receiving any appeal may, after hearing the appellant or without hearing the appellant, dismiss or allow the appeal or vary the conviction or punishment:

Provided that he shall not increase or add to the punishment unless the appellant has been given an opportunity of being heard by the Director, or by an officer nominated for that purpose by the Director.

(3) The Director may dismiss from the Service or reduce in rank any under officer or serviceman who is convicted of any offence by a court.

8. (1) Any member of the Service may be interdicted or suspended from duty by the Director, pending an inquiry into the conduct of the officer.

(2) Such member while under interdiction, or suspension shall continue to be subject to the same discipline and penalties and to the same authority as if he had not been interdicted or suspended.

[Subsidiary]

9. (1) All fines or stoppages imposed on an under officer or serviceman in respect of a disciplinary offence under these Regulations or an offence under the Act may be recovered from the offender's pay and allowances due to him at the time of committing such offence or thereafter accruing to him.

(2) The amount recovered in respect of such fines or stoppages shall be in the discretion of the officer by whom the fine or stoppage was imposed, but shall in no case exceed one-half of the monthly pay or allowances of the offender, and whenever more than one order of stoppage is in force against the same person not more than one-half of his monthly pay and allowances shall be stopped.

(3) Where more than one order of recovery of fines or stoppages is made upon the same person, the order or orders later in date shall if necessary be suspended until the earlier order has been discharged.

10. In all inquiries into disciplinary offences, the presiding officer shall satisfy himself that the accused person brought before him is the person named in the charge sheet (which shall be made out in the form in the Schedule to these Regulations), and shall then proceed as follows—

- (a) record that the accused person is before him and that he has been charged with the particulars of the offence as shown in the charge sheet;
- (b) record that the accused admits that he understands the charge and has been required to plead thereto;
- (c) record the plea of the accused, which should be recorded in the language used by the defaulter;
- (d) a plea of "not guilty" shall be recorded as such and an equivalent plea shall be treated and recorded as a plea of "not guilty";
- (e) if the plea is one of "not guilty", the presiding officer shall hear all the prosecution witnesses, and the defaulter shall be given the opportunity to cross-examine them; notes of the salient points made by the prosecution shall be recorded;
- (f) after hearing the prosecution witnesses the presiding officer shall then decide whether a prima facie case has been established against the accused; if the evidence for the prosecution appears to the presiding officer to be unconvincing or conflicting, he shall record dismissal of the charge, but if a prima facie case has been made out the defaulter shall be asked to make his own statement and to call witnesses in support of his defence; the presiding officer shall closely examine the accused and the defence witnesses to see whether he is satisfied beyond reasonable doubt as to the guilt of the accused;

(g) on reaching the conclusion that the accused is guilty of the charge, the presiding officer shall record a short judgment on the case, giving his reasons for reaching his conclusions; after recording anything the offender has to say in mitigation, sentence shall then be passed and the case record signed and dated; a further signed certificate shall then be added to the case record by the presiding officer that the offender has been informed of his right to appeal to higher authority against the decision and his election in this regard shall be recorded and signed by him;

[Subsidiary]

(h) if a charge is dismissed or the accused person is subsequently found "not guilty", no entry shall be made in the punishment register or on the accused person's record of service; if a punishment is awarded which does not require confirmation, the necessary extracts from the charge sheet and the case-record shall be written in the punishment register and the offender's record of service, but if the defaulter appeals against the decision no entry shall be made in the record of service until the result of the appeal is made known and only the final decision shall be recorded, when both the original award and the final decision shall be recorded in the register;

(i) the charge sheet and case record shall be filed and carefully preserved.

11. In the exercise of disciplinary powers, presiding officers shall constantly bear in mind the following principles—

- (a) that no punishment shall be awarded unless there has been full and careful inquiry and the presiding officer is satisfied beyond reasonable doubt that the offence has been committed;
- (b) that where there is doubt as to the true facts the accused must be given the benefit of the doubt and the charge dismissed;
- (c) that no person shall be punished until he has had an opportunity of hearing the charge and evidence against him, of making his defence and of calling witnesses in support of his defence;
- (d) that no person may be punished twice for the same offence.

SCHEDULE

(r. 10)

NATIONAL YOUTH SERVICE

Charge Sheet

No. ....	Rank .....	Name .....
Field Unit .....	Project Camp .....	
Date of Offence .....	Date of Proceedings .....	of the National
Charge contrary to regulation .....	Charge contrary to regulation .....	of the National
Youth Service Regulations.		
Particulars of offence .....		
Witnesses .....		
Plea .....		
Judgment .....		
Sentence .....		

[Subsidiary]

The Accused Person wishes/does not wish to exercise his right of appeal against conviction/punishment/conviction and punishment.

Signature of Accused Person .....

Presiding Officer .....

Signature .....

Designation .....

Date .....

Confirmed by .....

Signature .....

Designation .....

Date .....

Accused Person enlisted .....

Date of Offence .....

Number of Previous Offences .....

General Character .....

\*Precis of Evidence to be attached.