

(C) RADIO THEORY

1. BASIC MATHEMATICS AND PHYSIC : –

Logarithms, decibel, Universal Unit System (MKS). Introductory idea of co-ordinate geometry with reference to Latitude and Longitude. Pythagoras theorem.

2. ELECTRICITY : -

Charge and potential difference with unit, Electro motive force, Current and Voltage with units. Resistance and its unit. Factors on which resistance depends. Series and parallel combination, types, properties and uses of resistance. Colour coding of resistance, Ohms law, Kirchoffs law and its application. Capacitances and its unit, factors on which the capacitance depends, their series and parallel connection. Types, Properties and uses. Study of switch, Plugs and fuses.

3. ELECTROMAGNETISM : -

Magnetic elements and their properties, Hysteresis. Faraday's laws, Lenz's laws, Fleming's left hand & right hand rule, Rotation of conductor in magnetic field, Dynamo and motors. Working of speakers and microphones etc. Electromagnet Induction: Self and mutual induction and its unit. Factors on which inductance depends, types, properties and uses of inductors.

4. A.C. THEORY :-

Alternating Current and Voltage. Peak , RMS and average values. Frequency and phase of A.C, Idea of three phase. A.C. R-C, L-C R-L-C circuit. Series and Parallel resonance, Q factor. Capacitive and inductive reactance their unit. L-C Filter - Low Pass, High Pass, Band Pass etc. Theory of Transformer: Construction, Turns Ratio, Types, Properties and uses of transformer, impedance matching, Simple idea about losses and efficiency.

5. ELECTRONIC DEVICE AND CIRCUITS : -

5.1 Semi Conductors - Semi Conductors structure (Germanium and Silicon), Impurity, Doping, Formation of P and N Type material. P-N junction diode and its characteristics. Zener diode and Varactor Diodes.

5.2 Transistors- Operation of PNP and NPN, Transistor biasing (active, cut-off, saturation), CE-CB-CC configuration with comparison, DC & AC analysis of transistor. Operation of Field effect Transistor.

5.3 Opto-Electronic Devices: General introduction, Light emitting diode (LED), Seven Segment display, Photo diodes- Photo sensor and Photo cell.

5.4 Amplifier- class-A class-B class-C push pull amplifier circuit, Basic Idea of biasing arrangement. basic A/F and R/F amplifiers, voltage and power amplifiers. Operational amplifier- use and properties.

5.5 Multi vibrator – a stable, mono stable, bi stable.

5.6 Oscillator- definition, basic requirement, Types of sine wave oscillator, Crystal oscillator. Idea of freq. synthesizer, freq. spectrum.

6. POWER ELECTRONICS :-

- 6.1 Power Supplies - Semiconductor diodes as a half wave, full wave rectifier. Principle of voltage regulation, regulator circuit using Zener diode, conventional regulated dc power supply, SCR, Thermistors, SMPS DC power supply, AC Voltage stabilizers. Batteries charger.
- 6.2 Batteries-Primary and Secondary Batteries, types of Batteries, Series and parallel combination of batteries, Charging and Discharging. fault and remedy for the lead acid batteries. Effect of over charging and discharging, sulphation, Ni-MH batteries-their construction & maintenance. VRLA & Tubular Batteries.

7. MODERN COMMUNICATION TECHNIQUES : - .

- 7.1 POLNET - Concept of Polnet, Network system star, mesh and hybrid configuration. Dish Antenna, VSAT, Indoor Out door Unit, Operational Block Diagram of earth station, and advantages over the other communication. MART-General Idea of MART.
- 7.2 Data communication – features & Operation of IDT.
- 7.3 Trunking System- Introduction, operation, working, function of main components, advantages etc.
- 7.4 Dial 100 – Introduction and operation.
- 7.5 Automatic Vehicle location system (AVLS) - Introduction and operation.
- 7.6 CCTV- Introduction and operation.
- 7.7 Solar System – Auto switch/PCB/MPPT charge controller/Intelligent charge controller, BTY charging system.

8. DIGITAL ELECTRONICS :-

Number system, Boolean algebra. Introduction to Logic gates and Circuits. Multiplexer & demultiplexer, Flip-Flop, Registers, Counters. Introduction to Microprocessor and its applications in Radio Sets.

9. RADIO COMMUNICATION TECHNIQUES AND SYSTEMS :-

- 9.1 Modulation - Need of modulation ,Types of modulation- A.M., F.M. ,P.M.- Definition, mathematical equation, freq. deviation, modulation index & percentage of modulation, side bands, power of side band & problems, Generation of A.M. (DSB, SSB), F.M. & P.M. Relative merits & demerits of AM (DSB, SSB), FM & PM.
- 9.2 Basic block diagram of AM/FM Transmitter.
- 9.3 Modes of emission & their symbols, Block diagram of H.F. telegraphy.
- 9.4 Demodulation - Definition & detection of A.M.(DSB, SSB),F.M. & P.M Basic block diagram of AM/FM receiver, Double superhetrodyne receiver, parameters of receiver, choice of IF, AGC in AM receiver. Pre-emphasis, De-emphasis, limiter & squelch in FM receiver.
- 9.5 Repeater- Simplex, Semi-duplex & duplex working repeaters.
- 9.6 Pulse code modulation, Sampling, Quantization, Encoding.

10 ELECTROMAGNETIC RADIATION, WAVE PROPAGATION AND ANTENNA

- 10.1 Propagation of Electromagnetic waves, ground, sky, & space waves (Troposphere & line of Sight communication), Ionosphere/sky wave communication - critical freq., skip distance, skip zone, M.U.F, day & night frequency..
- 10.2 Antenna- Definition, application of antenna, Antenna characteristics- directivity, gain, Radiation pattern. Types of antenna, Half wave dipole antenna, G.P. antenna, folded dipole reflectors & directors, Yagi, Whip, Helical, Dish antenna.
- 10.3 Transmission line – Definition, characteristic impedance, losses in the lines, SWR, type of co-axial cables and connectors.

11 ORGANIZATION FUNCTIONALITY :-

- 11.1 Introduction of MP Police Telecom Organization Structure.
- 11.2 Role, functions & duties of different sections i.e. Communication, Purchase , Planning , Store , PRC , Workshop , Admin. etc. at PDS HQ, Zonal HQ, Range HQ & District Level.

COMPUTER PRACTICAL :-

Fundamental of Computer, Windows, Hardware / Software installation, Hindi/English Typing, MS Word, Excel, Power Point, email-internet, Bulk SMS, Skype, Configuration of Internet, Printers

-----00000-----

PRACTICAL (Grade III BRT)

SCHEDULE 1

MULTIMETER & ITS USES

- (AVO) Multi meter and its Type
- Measurement of AC/DC Voltage & Current.
- Elementary Knowledge of light, Fan and Power wiring, Earthing and Cable jointing Graded Fused
- Resistor, Capacitor, Inductor (Mike Speaker),
- Transistor, Transformer, Relay, Diode & Bridge Testing.

SCHEDULE 2

POWER SUPPLY (Introduction & Fault Finding/Remedy)

- Soldering & Desoldering
- Fabrication of Rectifier
 - (A) Half Wave Rectifier
 - (B) Full Wave Rectifier
 - (C) Bridge Rectifier
- Battery Charger & Battery Charging
- Regulated power supply
- Switch Mode Power Supply (SMPS)
- Solar Power Pack/ Bank
- Design and fabrication of logic gate With True table

SCHEDULE 3

SPECIFICATION AND OPERATING OF RADIO SET'S

- GM300
- GM950 I
- GM338
- GP328 & GP338
- GP2000
- MS707
- SIMOCO REPEATER
- KENWOOD 45W REPEATER
- TK2170
- TK7160
- MTX960
- XTS2500
- XTL1500
- MAX638

SCHEDULE 4

ANTENNA & ITS TYPES

- Various type of Antenna
- Operation & Maintenance
- Co-axial cable

SCHEDULE 5

MEASURING INSTRUMENT & FEATURES

- RF Output Meter
- Signal Generator
- Service Monitor (Radio Test Set Meter)
- Frequency Counter
- Standing Wave Ratio Meter
- AC milivolt meter
- Audio Output Meter

SCHEDULE 6

- RADIO SET PARAMETER TESTING

SCHEDULE 7

PROGRAMMING OF ALL TYPES HF./V.H.F./U.H.F. (TRUNKING SYSTEM) RADIO SETS WITH MP ALLOTTED FREQUENCY.

SCHEDULE 8

VHF NETWORKING & REPEATER

Simplex Repeater Unit

- Duplexer (D)
- 1 Duplexer +1 Radio & 1 Duplexer +2 Radio
- Universal Patch Card
- Repeater Station installation

SCHEDULE 9

GM 300 & GP 328 (Introduction & Fault Finding/Remedy)

- RF Probe Fabrication
- Layout
- Block Diagram of Receiver & Transmitter
- Micro Computer & Logic Gate
- Fault Finding
- Signal Path AC & DC.
- General Fault and Remedy in GM 300& GP328.

SCHEDULE 10

FAMILIARIZE , STATION VISIT & AERIAL INSTALLATION

- Radio Mobile Software.
- IDT- Hardware & Software Installation & Configuration.
- Aerial Installation on field.
- Visit of Radio Station.
- V.I.P. Radio Station Installation.
- G.P.S.
- Visit to POLNET, IDT & Solar System at Zonal HQ PRC.
- Visit to RTS, DIAL100 System, AVLS at Police Control Room.

SCHEDULE 11

Field Visit : ATC, Railway Signal System, Doordarshan Kendra etc.

SCHEDULE 12

RT ETIQUETTE

- Dictation & Hand Writing improvement
- RT Talking & Etiquette, Type of message, Priority, Call Sign
- Communication Skills & Security.

SCHEDULE 13

- Project work, PPT Presentation

Examination Chart Of Basic Radio Technician Course

S.NO	SUBJECT	CHAPTER NO	MARKS
1	Radio Theory paper I	Chapter 4, 5, 6, 7	100 Marks
2	Radio Theory paper II	Chapter 8, 9, 10, 11.	100 Marks
3	Workshop Practical I Paper	(Practical 75, Viva25) schedule 1,2,4,5,8,10.	100 Marks (Practical 75, Viva25)
4	Workshop Practical II Paper	(Practical 75, Viva25) schedule 3, 6, 7, 9.	100 Marks (Practical 75, Viva 25)
5	Computer Practical	Fundamental of Computer, Windows, Hardware / Software installation, Hindi/English Typing, MS Word, Excel, Power Point, email-internet, Bulk SMS, Skype, Configuration of Internet, Printers	(100 Marks) Ms word Hindi & English Typing 30 marks MS Excel 20 marks Power point 20marks Viva 30 marks.
		Total	500 marks

=====00000=====

APPROVED BY DGP MP

- S. G. OF POLICE (TC)
M.P. BHOPAL.