

MODIFIED/ RESTRUCTURED SYLLABUS FOR DEPARTMENTAL EXAMINATION (for promotion of Helper to the grade of Technician) [Revised - 2008]

The revised examination pattern consist of

- i) **Written Test consisting of one paper of 3 hours duration carrying 200 marks. Out of which Part-I is compulsory for all the candidates and of 100 marks. Part-II consists of two parts i.e (Part II – A : Basic of Radio Broadcasting) and (Part II – B : Basic of TV Broadcasting). Candidate may choose either Part II – A or Part II – B. Each part is of 100 marks.**
- ii) **Practical Test of 3 hours duration carrying 100 marks**

i) Written Test- 200 marks

Part I : BASIC PRINCIPLES OF ELECTRICITY AND ELECTRONICS-(100 MARKS)

1. Concepts of voltage, Current, Power Energy and their units. Ohms law and its applications.
2. Identification & functioning of components like resistors, inductors, capacitors and their colour codes. Voltage and power ratings, series and parallel combination of components.
3. Different types of batteries, their charging, trickle charging, care and maintenance. Solar cells/panels.
4. DC supply, AC single phase and three phase supply, regulation, power factor.
5. Electrical symbols, standard wire gauge, fuses, switch-gears, earthing practices, domestic wiring, meters like standard voltmeters, Ammeters, multi-meters, meggers etc.
6. Functioning of AC and DC motors, starters for motors, Star/Delta connection. Speed regulation, rating of motors and basic maintenance.
7. Working of transformers, turns ratio, Primary/Secondary voltage, tapings on windings, transformer cooling, transformer oil testing and its filtering.
8. Identification and basics of active elements like various types of vacuum tubes, semi conductor devices and transistors. Circuit configurations of transistors and comparison with valve circuits. Basics of FET, SMPS and digital basics.
9. Different types of Amplifiers, Rectifiers, Oscillators their characteristics and application.

PART-II

Part II – A: BASIC OF RADIO BROADCASTING- (100 marks)

1. Broadcast chain from microphone to studio output including Announcer console pre-amplifier, Programme Amplifier, Switching Console, Equalising Line Amplifier etc. Maintenance of studio equipment
2. Knowledge of control of programmes in terms of level and quality, monitoring devices such as : VU meter, headphone, loudspeaker, Monitoring amplifier etc.
3. Basic of Audio Tape Recorders
4. Outside broadcast set up; tools, equipment and precautions.
5. Broadcast chain for AIR transmitter from input to antenna at transmitter site. Functions of important components and stages like limiter, AF stages, RF stages etc and other ancilliary equipments.
6. FM transmitter and its associated equipments.
7. Various types of aerials and feeders used in AIR. Their characteristics and functions.
8. Studio transmitter link and receiving equipment, Radio Networking Terminal
9. Servicing procedures for Radio, tools and equipments used for servicing.
10. Concept of dB, dBm, VU; Frequency Response; Distortion and Noise Level.
11. Attenuators, pads, multiple pads, repeat coils, Equalizers and filters.
12. Different type of microphones and their applications.
13. Basics of Satellite communication
14. Petrol and diesel generators their working principles; functions of various components and maintenance.
15. Identification of components and functioning details in respect of air-conditioning plants including windows air-conditioners; Charging of gas, leak detection and purging.
16. Safety precautions, fire fighting and first aid practices as given in AIR Manual of Safety precautions.

Part II-B: BASIC OF TV BROADCASTING- (100 marks)

1. Basic of Video Tape Recorders
2. Outside broadcast set up; tools, equipment and precautions
3. Various types of aerials and feeders used in Doordarshan. Their characteristics and functions.
4. Studio transmitter link and receiving equipment, TVRO and DRS
5. Working knowledge of studio chain in TV studio from camera to studio output.
6. Basic principles of lighting in TV studio. Care and handling of lighting equipment.
7. Facilities in TV OB Van, laying cables for audio/ video, power supply and microwave links. Handling and care of ENG and EFP equipments and other studio equipments.
8. Broadcast chain for TV transmitter from input to antenna. Functions of important units of Low Power Transmitters (LPTs / VLPTs), Medium Power and High Power Transmitters, (VHF/UHF)
9. Servicing procedures for TV receiver, tools and equipments used for servicing.
10. Concept of dB, dBm, VU; frequency Response; Distortion and Noise Level.
11. Attenuators, pads, multiple pads, repeat coils Equalizers and filters.
12. Different type of microphones and their applications.
13. Basics of Satellite communication
14. Petrol and diesel generators their working principles; functions of various components and maintenance.
15. Identification of components and functioning details in respect of air-conditioning plants including windows air-conditioners; Charging of gas, leak detection and purging.
16. Safety precautions, fire fighting and first aid practices as given in AIR Manual of Safety precautions

Practical Test of 100 marks

Testing of skills in the following practicals:-

1. Soldering
2. Care & use of various mechanical and electrical tools used in our networks.
3. Operation, maintenance and routine measurements on air conditioning plants.

4. Operation and maintenance of Diesel Generators.
5. Electrical wiring, replacement of switches, fuses and other components.
6. Use of various meters like multimeter, sling Psychrometer, Tachometer, hydrometer, Anemometer, Halide leak detector and various pressure gauges.
7. Use of Test instruments such as insulation tester, Transistor tester and IC tester & Oscilloscope.
8. Dismantling and assembling of electrical/electronic equipment.
9. Maintenance of lead storage batteries.
10. Use of fire fighting equipment and safety gadgets.
11. Ability to read technical pamphlets.

Model Question Paper

**Model Question Paper as per revised pattern
For Departmental Competitive Examination for
promotion from Helper to Tech. (on the basis of
modified/restructured Syllabus-2008).**

INSTRUCTIONS TO CANDIDATES

This paper contains two parts

Part-I-

This part is compulsory for all candidates & of 100 marks.

PART-II A & II B:-

Choose either Part-II A or Part-II B and answer all questions in the part chosen. Do not choose some questions from Part-II A and some from Part-II B. Such papers will be rejected. Each part i.e Part II-A or Part II-B is of 100 marks.

Part-I (COMPULSORY)
Basic Principle of Electricity & Electronics

Question No.(I) -This question contains 25 questions of 2 marks each.

Mark **X** against the correct answer -

(50)

1.	Which of the following is expressed in ohm?
(a)	$V \times I$
(b)	V^2/R
(c)	V/I
(d)	I^2R
2.	The unit of energy is:
(a)	Volt
(b)	Ampere
(c)	Watt
(d)	Joules
3.	In a full wave rectifier, the of diodes are
(a)	1
(b)	2
(c)	3
(d)	4
4.	Three condensers each of $3 \mu F$ are connected in series. Total capacitance of the
(a)	$9 \mu F$
(b)	$1/9 \mu F$
(c)	$3 \mu F$
(d)	$1 \mu F$
5.	Two batteries of 24V each are connected in parallel. The output voltage will be:
(a)	12 V
(b)	24 V
(c)	48 V

(d)	20 V
6.	Clip on meter will indicate:
(a)	Voltage
(b)	Current
(c)	Resistance
(d)	Power
7.	Varnish is applied to the coils of a motor to prevent:
(a)	corrosion
(b)	dust
(c)	temp. rise
(d)	moisture
8.	Fuse wire melts due to:
(a)	Over voltage
(b)	Over current
(c)	Over resistance
(d)	None of the above
9.	The acid used in wet batteries is:
(a)	Nitric acid
(b)	Acetic acid
(c)	Hydro chloric acid
(d)	Sulphuric acid
10.	Commutator is used in:
(a)	Induction motor

(b)	DC motor
(c)	Transformer
(d)	Diesel Engine
11.	Tachometer is used to measure:
(a)	Rotational speed of an engine
(b)	Velocity of air flow
(c)	Velocity of water flow
(d)	Specific gravity of battery
12.	Filtering of transformer oil is done to improve:
(a)	Acidity
(b)	Breakdown voltage
(c)	Density
(d)	Viscosity
13.	Tappings are used in a transformer to:
(a)	Control the power factor
(b)	To adjust mains voltage variations
(c)	Improve the KVA rating
(d)	Heat the oil
14.	Workshop cable is:
(a)	Single core
(b)	Twin core
(c)	Three core
(d)	All the above
15.	A current is said to be alternatin when it changes in:
(a)	Magnitude only
(b)	Direction only
(c)	Both magnitude and direction
(d)	Remains constant
16.	Which of the following quantities are the same in all parts of a series circuit?
(a)	Voltage
(b)	Power
(c)	Current
(d)	Resistance
17.	Source, Drain, Gate are the terminals of the following semi conductor device:
(a)	NPN Transistor
(b)	Zener diode
(c)	FET
(d)	Schottky diode

18.	In a transistor, the function of emitter is similar to the following electrode of Valve:
(a)	Cathode
(b)	Control grid
(c)	Screen grid
(d)	Anode
19.	For the working of class A amplifier, bias voltage is:
(a)	Below cut off
(b)	Above cut off
(c)	Equal to cut off
(d)	No bias is required
20.	Diode is a:
(a)	uni-junction device
(b)	Bi-junction device
(c)	Tri-junction device
(d)	Four junction device
21.	Gain is measured in:
(a)	Hz
(b)	Volt
(c)	dB
(d)	KW
22.	Negative feedback in amplifiers
(a)	Build-up of oscillations
(b)	Reduced voltage gain
(c)	De-stabilisation of voltage gain
(d)	Increased voltage gain
23.	The capacity of a hard disk is expressed in:
(a)	GB
(b)	GHz
(c)	RPM
(d)	Volt
24.	In an n-p-n transistor the emitter Current is:
(a)	slightly more than collector

	current
(b)	slightly less than collector current
(c)	Equal to collector current
(d)	Equal to base current
25.	If a battery is connected across a P N junction with P- type to the negative terminal and N- type to the positive terminal, the junction is said to be:
(a)	Direct biased
(b)	Reverse biased

(c)	Forward biased
(d)	Unbiased

Q.2

a) Fill in the blanks (20)

- 1) Two units of electrical energy consumption is equivalent to 2000_____
- 2) When a lead acid battery is fully charged, the hydrometer reading will be _____
- 3) Gain of an amplifier is expressed in _____
- 4) For repairing a PCB, it will be preferable to use a _____
- 5) 1 Pico Farad (Pf) is equal to _____Farad.
- 6) Ammeter is connected in _____ in an electric circuit.
- 7) The supply required for charging a lead acid battery is _____
- 8) The frequency of DC (Direct Current) is_____
- 9) Four 1.5 V cells are connected in series. The resultant output voltage will be _____ Volt.
- 10) The number of bits in a byte is _____

(b) State whether True or False. (10)

1. 'Heat sinks' are provided to power transistor to dissipate heat.
2. Class 'C' amplifier will have least distortion.
3. 10 SWG copper wire is preferred to 8 SWG copper wire for earthing an electrical apparatus.
4. A capacitor 8 MFD will not block the passage of DC current.
5. One BHP measures 746 watts.

Q.3 Draw circuit/symbols of the following: (10)

1. Change over switch
2. Tube light circuit with protective fuse
3. Two parallel resistances of 20 ohm and 25 ohm connected in series with 100 ohms resistance.
4. PNP Transistor
5. Zener diode

Q.4 Write full form of the following with reference to electrical/electronic system

1. ACB
2. KVA
3. RMS
4. SMPS
5. FET

PART-II

Choose either PartII A or PartII B and answer all questions in the part chosen (100 Marks for each part).

PART II A –(BASIC OF RADIO BROADCASTING)

Question No.(I) - This question contains 25 questions of 2 marks each.

(50)

Mark X against the correct answer

- | | |
|---|--|
| <p>1. Amplitude Modulation is not used in:</p> <p>(a) M.W. sound broadcasting</p> <p>(b) S.W. sound broadcasting</p> <p>(c) TV video modulation</p> <p>(d) TV audio modulation</p> | <p>(b) Converts electromagnetic energy into electrical energy as receptor.</p> <p>(c) None of the above.</p> <p>(d) Both of the above.</p> |
| <p>2. For a diesel generator, the best option is to have</p> <p>(a) One separate earthing for neutral and body of D.G.</p> <p>(b) Same earthing for neutral and Body of D.G</p> <p>(c) Two separate earthing for Neutral and body of D.G</p> <p>(d) Equipment earthing extended to neutral and power supply earthing to body of D.G</p> | <p>5. The word 'Ku' is used to refer to:</p> <p>(a) Copper</p> <p>(b) A special antenna</p> <p>(c) Vacuum tube</p> <p>(d) A part of electromagnetic spectrum</p> |
| <p>3. Austin transformer is used in</p> <p>(a) T.V transmitter</p> <p>(b) M.W transmitter</p> <p>(c) F.M transmitter</p> <p>(d) S.W. transmitter</p> | <p>6. Symptoms of snake bite are:</p> <p>a) Vomiting</p> <p>b) Nausia</p> <p>c) Local pain</p> <p>d) All the above</p> |
| <p>4. An antenna</p> <p>(a) Converts electrical energy into electromagnetic energy by radiating</p> | <p>7. A Geostationary communication Satellite is placed</p> <p>(a) 36000 km above equator.</p> <p>(b) On North Pole.</p> <p>(c) On South Pole.</p> |

- (d) Above tropic of cancer in northern hemisphere.
8. Dehydrator in TV HPT/FM transmitter is required to:
- Maintain dry air in transmitter hall
 - Maintain temperature in feeder cable
 - Maintain dry air in feeder cable
 - Maintain vacuum in feeder cable
9. Gun microphone is used in
- Talk studio
 - Music studio
 - T.V studio
 - O.B. coverage
10. RF microphones use trans receive frequencies
- In short wave range
 - In VHF range
 - In UHF range
 - Both in VHF and UHF range
11. Suppose you suddenly come across a colleague who is stuck to live bus bars in sub station, your first action should be to:-
- Switch off the supply
 - Pull him away from the bus bars By grasping his clothes
 - Immediate call for medical assistance
 - Start artificial respiration immediately
12. Expansion valve in A.C. plant
- reduces the pressure of refrigerant liquid
 - increase the pressure of refrigerant liquid
 - start the compressor
 - none of the above
13. Reverberations are due to
- Refraction of sound
 - Reflection of sound
 - Diffraction of sound
- (d) Interference of sound
14. Phantom power supply is used in
- switching console
 - UPTR
 - condenser microphone
 - Dynamic microphone
15. The level of microphone output is
- 0 dbm
 - 10dbm
 - +4dbm
 - 70dbm
16. Which is the most appropriate Statement for a CD
- Audio is recorded in a magnetic material
 - Analog audio is recorded optically
 - Audio is converted to digital signals and recorded
 - No statement is correct
17. Ground wave propagation is mainly used for
- M.W. broadcasting
 - F.M. broadcasting
 - Short wave broadcasting
 - Micro wave broadcasting
18. In 3 pin XLR connector, the pin connected to ground is
- pin no. 1
 - pin no. 2
 - pin no. 3
 - None
19. The signals recorded on a compact disk are detected by
- Laser beam
 - crystal
 - Air jet
 - Infra rays
20. PADs are used for
- Amplification
 - Attenuation
 - Both
 - Neither of the two mentioned above.
21. The type of Fire Extinguisher used for fire on oil in HT transformer is:.

- (a) Foam
 (b) CO2 type
 (c) Soda acid
 (d) Dry powder
22. The spark plugs of a diesel generator need to be cleaned
 (a) once in a month
 (b) once in six month
 (c) once in a year
 (d) question of cleaning of spark plug does not arise.
23. Over modulation in medium wave transmitters is when.
 (a) Modulation is more than 100%.
 (b) Modulation is less than 100%.
 (c) Modulation is less than 50%.
 (d) Modulation is 100%.
 (c) RF circuit
 (d) Power circuit
24. Normally the size of receive disk antenna for S- band system is
 (a) More than that of C-band system
 (b) Less than that of C-band system
 (c) same as of Ku-band system.
 (d) It can be of any size.
25. Repeat coils are used in
 (a) Audio circuit
 (b) Video circuit

Q.2 Fill in the Blanks: (20)

1. In a tape recorder _____ head has the widest gap.
2. Self radiating tower is used for _____ transmitter.
3. _____ microphone is used in OB coverage to pick up sound from distance.
4. BALUN stands for _____
5. Dirty head of a console tape recorder causes _____ loss during play back/recording.
6. The refrigerant is changed from gas to liquid state in _____
7. Standard test tape is used for alignment of _____ chain of console tape recorder.
8. Audio recording is done on _____ side of CD.
9. Wind shields are used with microphone for _____ recordings.
10. The uplink frequency is generally _____ than the downlink frequency in satellite communication.

(b) State whether True or False (10)

- 1 VU meter is used for checking distortion of programme
- 2 In FM transmitter, the frequency of the carrier changes with modulation
- 3 Resistance of earth pit will be of the order of 10 ohms
- 4 Coaxial cable is not a transmission line.
- 5 Radio Networking terminal (RN) in AIR operates in Ku band

Q.3 Draw circuit/symbols/diagram for the following: (10)

1. Tetrode valve
2. A.M. wave
3. Frequency response of Band pass filter (BPF)
4. 1KHZ audio signal
5. Repeat coil

Q.4 Write full form of the following abbreviations.

(10)

1. dB
2. LNBC
3. OB
4. VHF
5. LED

Part-II-B

BASIC OF TELEVISION BROADCASTING

Question No.(I) - This question contains 25 questions of 2 marks each.

Mark X against the correct answer

(50)

- 1 In a Yagi antenna:
 - a) Director is longer than reflector
 - b) Reflector is longer than director
 - c) Director and reflector are of equal size
 - d) None of the above
- 2 To receive a signal from satellite, the type antenna to be used is:
 - a) Yagi
 - b) Double Dipole
 - c) Dish
 - d) Beam aerial with reflector
- 3 Soft light sources are used for:
 - a) Key lighting
 - b) Fill lighting
 - c) Back lighting
 - d) All the above
- 4 The satellite signal picked up by the parabolic dish antenna is first fed to:
 - e) Mixer
 - f) LNBC
 - g) Oscillator
 - h) Preamplifier
- 5) The instrument used for checking air flow in TV transmitter is:
 - a) Tachometer
 - b) Speedometer
 - c) Anemometer
 - d) Hydrometer
- 6 In a TV receiver, a balun is located between:
 - a) Antenna and Tuner
 - b) Tuner and IF section
 - c) Detector and audio amplifier
 - d) Mains and degaussing coil
- 7 A TV receiver shows a single horizontal line at the Centre and the full raster is missing. What will you suspect?
 - a) Fuse
 - b) EHT Transformer
 - c) Tuner
 - d) Vertical Oscillator

- 8 Input impedance of a TV transmitting antenna is:
- 100 ohms
 - 150 ohms
 - 50 ohms
 - 75 ohms
- 9 The carrier frequency of UHF TV transmitter is in the range of:
- 100MHz to 230 MHz
 - 230 MHz to 470 MHz
 - 30 MHz to 100 MHz
 - 3 MHz to 30 MHz
- 10 There are two T.V transmitters of 500 watts each located at the same place working on VHF band and UHF Band
- The coverage of VHF transmitter will be higher
 - The coverage of UHF transmitter will be higher
 - The coverage will be same during day time
 - The coverage will be same during night time
- 11 The primary objective of providing earthing to equipment is
- Safety of operating staff
 - Safety of equipment.
 - Save power consumption .
 - both a & b
- 12 Average RF power of a TV transmitter is measured by:
- Multimeter
 - Peak power meter
 - Thru-line watt meter
 - Sideband analyzer
- 13 TV transmitter
- has both AM modulation & FM modulation.
 - only AM modulation.
 - only FM modulation.
 - Step pulse modulation.
- 14 A film of ice gets deposited in window type room air conditioners because of
- Excessive humidity
 - Excessive cooling
 - Air filter being clogged.
 - Water has entered into the refrigerant.
- 15 RF microphones use trans-receive frequencies
- In short wave range
 - In VHF range
 - In UHF range
 - Both in VHF and UHF range
- 16 Gun microphone is used in
- Talk studio
 - Music studio
 - T.V studio
 - O.B. coverage
- 17 The spark plugs of a diesel generator need to be cleaned
- once in a month
 - once in a six months
 - once in a year
 - question of cleaning of spark plugs does not arise.
- 18 Diesel generator follows.
- One stroke cycle.
 - Two stroke cycle.
 - Three stroke cycle.
 - four stroke cycle.
- 19 An antenna

- (a) Converts electrical energy into electromagnetic energy by radiating.
- (b) Converts electromagnetic energy into electrical energy as receptor.
- (c) None of the above.
- (d) Both of the above.
- 20 The dimension specified by the manufacturers for the TV screen is
- (a) width
- (b) height
- (c) diagonal
- (d) none of these
- 22 The photovoltaic cells in a solar panel used in Doordarshan are connected
- (a) All in series
- (b) All in parallel
- (c) A combination of parallel and series
- (d) None of the above configuration
- 23 A Geostationary communication Satellite is placed
- (a) 36000 km above equator.
- (b) On North Pole.
- (c) On South Pole.
- (d) Above tropic of cancer in northern hemisphere.
- 24 The colour of moist Silica gel of a H.T.transformer is
- (a) Blue
- (b) White
- (c) Pink
- (d) yellow
- 25 For tackling petroleum & gas fire the type of fire extinguishers used will be.
- (a) Dry powder type
- (b) Co2 type
- (c) Soda acid type
- (d) Water type
- 21 For a diesel generator, the best option is to have-
- (a) Separate earthing for neutral and body of D.G.
- (b) Same earthing for neutral and body of D.G.
- (c) Two separate earthing for neutral and body of D.G.
- (d) Equipment earthing extended to neutral and power supply earthing to body of D.G.

- Q.2 Fill in the Blanks:** (20)
- 1 _____ microphone is used in OB coverage to pick up sound from _____ distance.
 - 2 In Indian TV system, the total RF channel bandwidth in VHF band is _____ MHz.
 - 3 BALUN stands for _____
 - 4 The refrigerant is changed from gas to liquid state in _____
 - 5 Wind shields are used with microphone for _____ recordings.
 - 6 The uplink frequency is generally _____ than the downlink frequency in satellite communication.
 - 7 Dynamo is used in a diesel engine for the purpose of _____.
 - 8 Red, blue & _____ are three colour beams used in coloured TV picture tubes.
 - 9 A VU meter reads the _____ value of wave form
 - 10 Resolution of picture quality on TV depends upon _____.

(b) State whether True or False (10)

1. Resistance of earth pit will be of the order of 10 ohms.
2. Vestigial side band system is used for TV transmission.
3. Function of the evaporator in A/C plant is to add heat
4. Ghost in TV reception is caused by line of sight.
5. When a TV receiver is switched "ON", the picture comes late because video signal takes longer time to arrive.

Q.3 Draw circuit/symbols for the following: (10)

1. Tetrode valve
2. Frequency response of Band pass filter
3. Variable capacitor
4. Full wave rectifier
5. Battery bank

Q.4 Write full form of the following abbreviations. (10)

1. DTH
2. dB
3. LNBC
4. DSNG
5. VLPT