

**FURTHER DETAILS REGARDING MAIN TOPICS OF
PROGRAMME No. 12/2019 (Item No.19)**

**JUNIOR INSTRUCTOR
(MECHANIC CONSUMER ELECTRONIC APPLIANCES)
(SPECIAL RECRUITMENT FROM AMONG SC/ST
AND ST ONLY)**

(INDUSTRIAL TRAINING)

(Category No.595/2017)

Basic Electricity

Basics of AC&DC

1. Voltage , Current & Resistance
2. +ve cycle, -ve cycle,frequency and timeperiod
3. RMS,Peak,Peak to peak & Instantaneous value
4. Single phase and Three phase supply
5. Terms like Line and Phase voltage/currents
6. Conductors,Semiconductors & their properties
7. Different types of electrical cables and their specifications
8. Standard wire guage.

Cells & Batteries

1. Construction of cells & Batteries
2. Types of primary and secondary cells
3. Materials used
4. Specifications of cells and batteries.
5. Charging process
6. Efficiency, Life of cell/battery etc.
7. Use of Hydrometer
8. Types of Electrolytes used in cells and batteries
9. Series/parallel connection of batteries and purpose of such connections.

Ohm's Law & Kirchhoff's Laws

1. Ohm's law & its variables
2. Types of resistors,their construction & specific use
3. Colour coding, Power rating
4. Series, Parallel and series-parallel circuits
5. KVL & KCL with applications

Induction & Inductors

1. Principles of induction

2. Inductive reactance
3. Types of inductors, Construction, specifications and applications (Energy storage concept)
4. Self and Mutual Induction
5. Behavior of inductor at low and high frequencies
6. Series & Parallel combination, Q factor

Capacitance & Capacitor

1. Capacitance & capacitive reactance
2. Impedance
3. Types of capacitors, construction, specifications and applications
4. Dielectric Constant
5. Series and parallel connections and its significance
6. Concept of time constant of a RC circuit
7. Concept of resonance and its application in RC, RL & RLC series and parallel types

Magnets & Relays

1. Properties of Magnets & their materials
2. Preparations of artificial Magnets
3. Signification of Electromagnetism
4. Types of cores.
5. Electro magnetic relays, types, construction
6. Specification of relay-coil voltage and contact current capacity

Transformers

1. Working Principle, Construction, Types of cores used.
2. Specification of a transformer
3. Step up, Step down and isolation transformers with applications
4. Losses in transformers
5. Phase angle, phase relations, active & reactive power, Power factor and its importance in industry.

AC & DC Measurements

1. Introduction to electrical measuring instruments
2. Importance & Classification of meters
3. Force necessary to work a meter
4. MC & MI meter
5. Range Extension
6. Need of calibration
7. Characteristics of meters
8. Errors in meters
9. Multimeters
10. Use of meters in different circuits
11. Care and maintenance of meters
12. Use of CRO, Function generator & LCR meter.

Protection Devices

1. Fuses, Fuse ratings, types of Fuses ,Fuse Bases
2. Single/threephase MCBs
3. Single phase ELCBs
4. Types of contactors, contactor coils and working voltages,
5. Contactor contact currents, protection to contactors and high current applications

Electrical control Circuits

1. Fundamentals of single phase Induction motors, synchronous speed, slip, rotor frequency, torque-speed characteristics
2. Starters used for Induction motors

Computer Hardware, OS, MS Office & Networking

Computer Hardware :

1. Basic blocks of a Computer
2. Hardware & Software
3. I/O devices, Keyboard, Mouse & their working
4. Different types of Printers and their working
5. HDD, CDD, DVD

Windows OS

1. Starting windows & its operation
2. File management using Explorer
3. Display & Sound Properties
4. Screen saver
5. Font Management
6. Installation & Programs
7. Setting & Using of control panel
8. Application of accessories

MS OFFICE

I. MS WORD

1. Menu Bar
2. Standard tool bar
3. saving, copying, deleting, retrieving files
4. page setting , editing, formatting , mail merging etc.
5. Tables and borders
6. Printing of document

II. M.S EXCEL

1. Worksheet basics
2. Data entry and formulae
3. Moving data in worksheet using tool bars and menu bars
- 4, Formatting & calculations
5. Printing worksheet
6. Creating multiple worksheets
7. Creating charts, placing charts in a word file

III. POWER POINT

1. Basics of preparing slides
2. Different design aspects of slides
3. Animation with slides etc.

Computer Networking

1. Network features - Network topologies
2. Protocols-TCP/IP,UDP,FTP
3. Network components
4. Network Medias
5. UTP,STP, Coaxial cables
6. Network components like hub, Ethernet switch, router, NIC cards,connectors
7. Media and firewall
8. Difference between PC &Server
9. OS,NOS –features ,types etc.
10. Physical topology of a network
11. Internet search engines and applications

Basic Electronics

Rectifiers

1. PN junction
2. Forward and Reverse biasing of diodes
3. Packing styles of diodes
4. Rectifier configurations, their efficiencies
5. Filter components and their role in reducing ripple

Special diodes

1. Working principles ,Specifications & Applications of Zener diode/
Varactor diode/Tunnel Diode.

IC Regulators

1. Regulated Power supply using 78XX series & 79XX series
2. IC 723 Regulator
3. Op-Amp Regulator
4. Voltage regulation,error correction and amplification etc(Transistorized & IC based)

Transistor

1. Construction
2. Working of PNP & NPN Transistors.
3. Significance of β of a transistor
4. Need of biasing of Transistor junctions
5. Junction temperature
6. Junction Capacitance
7. Frequency of operation
8. Application as a switch
9. Definitions of input impedance and output impedance
10. Transistor Power ratings & packaging styles
11. Use of heat sinks

Amplifier

1. Transistor(CB,CE & CC) configurations ,characteristics &applications
2. Transistor biasing circuits and stabilization techniques.
3. Classification of amplifiers according to frequency ,mode of operation, Methods of coupling
4. Voltage Amplifier
 - (i) Voltage gain, loading effect.
5. Configuration of common emitter,common base,common collector transistor Their definition,characteristics and applications
6. Single stage CE amplifier
7. Emitter follower and its advantages
8. RC coupled amplifiers
9. Distinguish between voltage and power amplifiers
10. Push-pull amplifiers
11. Class C tuned amplifier
12. Concept of dB,dBm
13. Feedback and its types

Oscillators

1. Introduction to positive feedback and requisites of an oscillator
2. Study of Colpitts,Hartley,crystal and RC oscillator
3. Study of multivibrators and study of circuit diagram

Wave Shaping Circuits

1. Diode shunt clipper circuits and clamping /limiting circuits And their applications
2. Schmitt trigger circuits

Power Electronic Components

1. Construction of FET, differentiate it with BJT
2. Purpose of Gate, Drain and source terminals and voltage /current relations Between them
3. Impedances between various terminals.
4. Interpret the main parameters of the FET.
5. Working of power electronic components such as SCR,TRIAC,DIAC and UJT.

MOSFET & IGBT

1. Working of MOSFET
2. Power MOSFET and IGBT-their types,characteristics,switching speed Power ratings and protection
3. Differentiate FET with MOSFET
4. Differentiate a transistor with IGBT

Opto Electronics

1. Working and application of LED,IR LEDs,photo diode,photo transistor and its characteristics and applications
2. Optical sensor, opto-couplers, circuit with opto isolators
3. Characteristics of LASER diodes

OP-Amp & Timer 555 Applications

1. Block diagram and Working of Op-Amp, importance, Ideal characteristics Advantages and applications.
2. Schematic diagram of 741,Non inverting &inverting voltage amplifiers Summing amplifier,comparator,zero cross detector,differentiator,integrator and instrumentation amplifier
3. Other popular Op-Amps
4. Block diagram of 555,functional description w.r.t different configurations Of 555 such as mono stable,Astable and VCO operations for various application.

Digital Electronics

Basic Gates

1. Difference between analog and digital signals
2. Logic families and their comparison
3. Logic levels of TTL and CMOS
4. Number systems(Decimal,binary ,octal,Hexa decimal)
5. BCD code,ASCII code and code conversions
6. Logic gates and their truth tables
7. Propagation delay,power dissipation and noise immunity

Combinational circuits

1. Half Adder,Full Adder,Parallel Binary adders,2-bit and four bit full adders.
2. Basic Binary decoder and four bit binary decoders
3. Concept of encoder and decoder
4. Need for multiplexing of data
5. 1:4 line multiplexer/Demultiplexer

Flip Flops

1. S-R latch, Gated S-R latch
2. D-Latch
3. Basic RS Flip Flop, edge triggered D flip flop, JK Flip Flop,T flip flop, Master slave flip flops and timing diagrams
4. Basic flip flop applications like data storage, data transfer and frequency division

Counter & Shift Registers

1. Type of counters

2. Two bit and three bit Asynchronous binary counters and decade counters with the timing diagrams
3. 3-bit Synchronous counters and synchronous decade counters
4. Types of seven segment display, BCD display
5. BCD to decimal decoder, BCD to 7 segment display circuits
6. Basics of Register, types and application of Registers

Microcontroller (8051)

1. Micro controller 8051,architecture,Pin details & the bus system
2. Functions of different ICs used in the Micro controller kit.
3. Differentiate Microcontroller with microprocessor.
4. Interfacing of memory to the microcontroller
5. Internal Hardware resources of microcontroller
6. I/O port pin configuration
7. Different variants of 8051 & their resources
8. Register banks & their functioning
9. SFRs & their configuration for different applications
10. Utilization of on chip resources such as ADC.
11. Applications of a microcontroller in domestic, consumer & industries
12. Comparison with 8052
13. PIC Architecture

Digital Storage Oscilloscope

1. Block diagram and application of DSO
2. Block diagram of Function generator
3. Differentiate a CRO with DSO
4. Advantages of DSO
5. Major features of DSO

Surface Mount Technology

Basic SMD

1. Identification of 2,3,4 terminal SMD components
2. Advantages of SMD components over conventional lead components
3. Solder paste and machine
4. Soldering of SM assemblies-Reflow soldering
5. Tips for selection hardware, Inspection of SM

SMD soldering and Desoldering

1. Identification of Programmable Gate Array (PGA) packages
2. Soldering /Desoldering of PGA components
3. Cold/Continuity check of PCBs
4. Identification of loose /dry solders, broken tracks on printed wiring assemblies

PCB Rework

1. **ESD control in Electronics:-** Static charges,Prevention of static charges, Handling of static sensitive devices,various standards of ESD
2. **Non soldering interconnections:** Crimping, wire wrapping
3. Conductive adhesives,chip on board,Tape Automated bonding
4. Construction of Printed circuit boards (Single,Double,Multi layer)
5. Important tests for PCBs
6. Different types of soldering guns, related to temperature and wattages, types of tips
7. Solder materials and their grading,cleaning solvents
8. Soldering and desoldering stations and their specifications
9. Types of conformal coating and its removal methods
10. Rework of through hole and surface mount soldered joints
11. Repair of damaged track & damaged pad
12. Repair of plated through hole
13. Repair of solder mask

Communication Electronics

Communication Basics

- Radio Wave propagation-Principle
 - Fading
 - Need of modulation
 - Types Modulation
 - Demodulation Techniques
 - Fundamentals of Antenna,various parameters
 - Types of antenna & application
 - AM,FM &PM, SSB-SC & DSB-SC
 - Block diagram of AM & FM transmitter
 - FM generation and detection
11. Radio Receivers :
 - (i) Types
 - (ii) Super heterodyne receiver blocks-Principle,characteristics,advantages and disadvantages
 - (iii) Block diagram of FM Receivers
 - (iv) RF, IF & AF Amplifier sections
 - (v) AM/FM RF Alignment
 12. Digital modulation and demodulation techniques, sampling, quantization& Encoding
 13. Concept of multiplexing and de multiplexing of AM/FM/PAM/PPM/PWM signals

Sensors,Transducers and Applications

- 1) Passive and active transducers, Role, selection and characteristics

- 2) Working principle of RTD,PT-100 Thermocouple
- 3) Sensor voltage and current formats
- 4) **Thermistors**-Salient features-operating range,composition,advantages & disadvantages
- 5) **Thermo couples**-basic principle-commonly used combinations,operating range,advantages & disadvantages
- 6) **Strain gauges**-Principle,guage factor,types of strain gauges
- 7) **Load cell**-Definition,uses,working of strain guage load cell
- 8) Principle of operation of capacitive transducers,LVDT & inductive transducers
- 9) Proximity sensors:- Application,capacitive & inductive proximity sensors

Electronic Cables & Connectors

- Cable signal diagram conventions
- Classification of electronic cables as per the application w.r.t . insulation, Guage,current capacity,flexibility etc.
- Different types of connectors& their termination to the cables.
- Male/Female type DB connectors
- Ethernet 10 base cross over cables and pinout assignments
- UTP , STP and SCTP cables
- Cable trays
- Different type of connectors , Servo 0.1 connectors,FTP,RCA,BNC,HDMI
- Audio/video connectors like XLR,RCA(Phono),6.3mm Phono,3.5/2.5mm Phono,BANTAM,SPEAKON,DIN,miniDIN,RF connectors,USB,Fire wire,SATA connectors,VGA,DVI connectors,MIDI etc.

Fibre Optic Communication

Optical fibre as a transmission media
 Its advantage over other media
 Properties of optical fiber, testing, losses
 Types of fiber optic cables and specifications
 Encoding of light
 Fiber optic joints,splicing,testing and the related equipment/measuring tools
 Precautions to be taken laying of cables
 Safety aspects while handling optical cables

Consumer Electronic Equipments

LCD and LED TV

Difference between a conventional CTV with LCD & LED TVs

Principle of LCD and LED TV and functions of each different sections

Basic principle and working of 3D TV

IPS Panels and their features

Different types of interfaces like HDMI,USB,RGBetc with latest TVs.

TV Remote Control-Types,parts and functions,IR Code transmitter and IR code Receiver

Working principle,operation of Remote control

Different adjustments,general faults in RemoteControl

LCD/LED Projector

27.Differentiate LCD and LED Projectors

28.Specifications of LED projector

29.Working principle of LED Projector

30.Most frequently occurring faults in a LED projector and their remedies.

DTH System

Basic satellite communication

Merits and demerits of satellite communication,applications

Types of satellites & its orbits

Satellite frequency bands

Basic components of DTH system: PDA,LNBC,Satellite receiver terminal,dish installation aspects,Azimuth& Elevation settings of dish/DTH receiver

Types of cables used in DTH system

Impedance and specification

Multi-dwelling unit sdesign

Headed amplifier,Line amplifier

Cascaded in/out multi-switch ,tap and splitter

Set top box features

Block diagram of set top box

I/O ports,Cable modem termination system

Software & Customer premises equipments

CCTV

Types of cameras and their specifications used in CCTV systems

CCTV Set up and its components

Working principle of Digital Video recorders and types of DVRs

Home theatre

Introduction to Home theatre, Surround sound system, basic components

Block diagram of home theatre & working

SMPS

Concept and block diagram of manual & automatic and servo voltage stabilizer, o/p voltage adjustment

Voltage cut-off systems

Study of different types of relays used in stabilizers

Study electronic circuit commonly used

Buck and boost concept

Block diagram of Switch Mode power supplies and their working principles

Various types of chopper circuits:: step up, step down, inverting types.

Introduction to DC-DC converters

ICs used for converting DC-DC

Block diagrams and their pinouts

Applications of DC-DC converters

Inverters, battery maintenance and UPS

The principle, operation, power rating and change over period of inverter.

Block diagram of Inverter

Installation of inverters

Protection circuits used in inverters:- Battery level, over load, over charging etc.

Principle and working of three phase inverter circuits

Installation of single phase & three phase inverters

Concept of UPS

Difference between inverters and UPS

Basic block diagram of UPS & Operation principle of rectifier, battery, inverter, static transfer switch

Types of UPS :- OFF line UPS, ON line UPS, Line interactive UPS & their comparisons

UPS specification ,load power factor &types of indications and protections

UPS circuit description & working of control circuits,microcontroller circuits,charging circuits,power circuits,alarms circuits & indicator circuits.

Printers

Printer & its types

Principle,Parts,Working of dot-matrix,inkjet & Laser Printer.Advantages & disadvantage of each

Comparison between impact & non impact printers

Cables used to connect the various printers to computer

Domestic Appliances

Microwave oven

Different types of oven

Study the various functions of oven

Block diagram of Microwave Oven

Electrical wiring diagram of Microwave Oven

Microwave generation system – Circuit

Description & working ,Working of Power supply

Washing Machine

Different types of machines,washing techniques

Block diagram

Semi automatic and fully automatic machines basic

Basic working principle of manual,semi automatic and fully automatic machines

Study the working of motors,different types of timers,power supply circuits

Vacuum Cleaner

Block diagram,Working principle

Main parts of Vacuum cleaner

Study of the different features of the machine

Study & working of motors used

Electronic circuit ,Power supply

Mixer/Grinder

- b) Various parts & functions of mixer/Grinder
- c) Speed control circuit & auto over load protector

Electric Iron

- 3 Principle of Electric Iron
- 4 Parts of steam iron
- 5 Thermostat heat controls

Water Purifiers

- 1 Working principle of RO and UV type of water purifiers
- 2 Different components of water purifier
- 3 Most frequently occurring faults and their remedies

Immersion Heater

- Principle of Immersion Heater
- Parts of Immersion Heater
- Insulation in Immersion Heater

Induction Cook Top

- Working Principle of Induction Cook top
- Study of different features of the machine
- Types of Induction tubes
- Study different component of Induction cook top
- Fault Identification
- Heat sinking in Induction cook top

NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper