

# ELECTRONICS & HARDWARE

## Job Role – Field Technician Air Conditioner

Class-11		Paper- I		Full Mark- 100	
Part -A	Employability Skills	No. of Theory classes	No. of Practical Classes	Max mark	
Unit - 1	Communication Skill-III	08	15	10	
Unit - 2	Self Management Skill-III	05	12		
Unit - 3	Entrepreneur Skill-III	05	12		
<b>Total</b>		<b>18</b>	<b>39</b>	<b>10</b>	
<b>Part-B</b>	<b>Vocational Skill (Basic Electricity)</b>				
Unit - 1	Current Electricity and D.C circuits	12	15	40	
Unit - 2	Electric Cells and Capacitors	08	12		
Unit - 3	Heating & Lighting effect of electric current	05	03		
Unit - 4	Electromagnetic Effects	10	13		
Unit - 5	A.C Circuits	8	12		
<b>Total</b>		<b>43</b>	<b>55</b>	<b>40</b>	
<b>Part-C</b>	<b>Practical Work</b>				
	Practical Examination		06	15	
	Written test		01	10	
	Viva Voce		03	10	
<b>Total</b>			<b>10</b>	<b>35</b>	
<b>Part-D</b>	<b>Project Work/ Field Visit</b>				
	Practical File/ Student Port folio		10	10	
	Viva Voce		05	05	
<b>Total</b>			<b>15</b>	<b>15</b>	
<b>Grand Total</b>		<b>61</b>	<b>119</b>	<b>100</b>	

Class-11		Paper- II		Full Mark- 100
Part -A	Employability Skills	No. of Theory classes	No. of Practical Classes	Max mark
Unit - 1	Basic Information and Communication Technology skills - III	10	27	10
Unit - 2	Green Skills - III	08	12	
	<b>Total</b>	<b>18</b>	<b>39</b>	<b>10</b>
<b>Part-B</b>	<b>Vocational Skill</b>			
Unit -1	Basic Electronics	14	15	40
Unit -2	Compressor Technology	08	13	
Unit -3	Installation of Air conditioner	12	15	
Unit -4	Workplace safety measures	9	12	
	<b>Theory</b>	<b>43</b>	<b>55</b>	<b>40</b>
<b>Part-C</b>	<b>Practical Work</b>			
	Practical Examination		06	15
	Written test		01	10
	Viva Voce		03	10
	<b>Total</b>		<b>10</b>	<b>35</b>
<b>Part-D</b>	<b>Project Work/ Field Visit</b>			
	Practical File/ Student Portfolio		10	10
	Viva Voce		05	05
	<b>Total</b>		<b>15</b>	<b>15</b>
	<b>Grand Total</b>	<b>61</b>	<b>119</b>	<b>100</b>

## PAPER -I( THEORY )

FULL MARK: 50

### Employability Skill

#### Unit I: Communication Skills – III

Methods of communication – Verbal, Non-verbal, Visual

#### Unit -2. Self-management skill-III

Importance of dressing appropriately, looking decent and positive body language, Grooming, Prepare a personal grooming checklist,

### **Unit 3: Entrepreneurial Skills – III**

Values in general and entrepreneurial values. Entrepreneurial value orientation with respect to inattentiveness, independence, outstanding performance and respect for work; Attitudes in general and entrepreneurial attitudes .

## **VOCATIONAL SKILLS**

### **Unit -1. Current Electricity & D. C Circuits**

Electricity as a source of energy, Definition of Resistance, Voltage, Current, Power, Energy and their units, Relation between electrical, mechanical and thermal units, Factors affecting resistance of a conductor, Temperature co- efficient of resistance, Difference between AC and DC voltage and current.

Ohm's Law. Series - parallel resistance circuits, calculation of equivalent resistance, Kirchoff's Laws and their applications.

### **Unit – 2. Electric Cells & Capacitors**

Primary cell, wet cell, dry cell, battery, series and parallel connections of cells, Secondary cells, Lead Acid Cell, Discharging and recharging of cells, common charging methods, preparation of electrolyte, care and maintenance of secondary cells.

Capacitor and its capacity, Concept of charging and Discharging of capacitors, Types of Capacitors and their use in circuits, Series and parallel connection of capacitors, Energy stored in a capacitor.

### **Unit -3. Heating & Lighting effect of electric current**

Joule's Law of electric heating and its domestic applications, heating efficiency, lighting effect of electric current, filaments used in lamps, and gaseous discharge lamps, their working and applications.

### **Unit 4 . Electromagnetic Effects**

Permanent magnets and Electromagnets, their construction and use, Polarities of an electromagnet and rules for finding them. Faraday's Laws of Electromagnetic Induction, Dynamically induced e.m.f., its magnitude and induction, Static induction, self-induced e.m.f., its magnitude and direction, inductance and its unit. Mutually induced e.m.f., its magnitude and direction, Energy stored in an inductance, Force acting on a current carrying conductor in magnetic field, its magnitude and direction, Torque produced on a current carrying coil in a magnetic field.

### **Unit- 5. A. C. Circuits**

Generation of a.c. voltage, its generation and wave shape. Cycle, frequency, peak value (maximum value), average value, instantaneous value, r.m.s. value, form factor, crest factor, phase, phase difference, power and power factor, A.C. Series Circuits with (i) resistance and inductance (ii) resistance and capacitance and (iii) resistance inductance and capacitance, Q factor of R.L.C. series circuits

**Paper -I( Practical )**

**FULL Marks:50**

## **Employability Skills**

### **Unit I: Communication Skills – III**

1. Writing pros and cons of written, verbal and non-verbal communication.
2. Listing do's and don'ts for avoiding common body language mistakes.

## **Unit -2. Self-management skill-I**

1. Demonstration of impressive appearance and groomed personality
2. Demonstration of the ability to self- explore

## **Unit 3: Entrepreneurial Skills – III**

1. Listing of entrepreneurial values by the students.
2. Group work on identification of entrepreneurial values and their roles after listing or reading 2-3 stories of successful entrepreneur.
3. Exhibiting entrepreneurial values in Ice breaking, rapport building, group work and home assignments.
4. Preparing a list of factors that influence attitude in general and entrepreneurial attitude

## **VOCATIONAL SKILLS**

### **Unit -1. Current Electricity & D. C Circuits**

1. Switch on/ off the electrical appliances such as electric fan, TV, Refrigerator and observe the presence of electricity.
2. Read the voltage, current, resistance, ratings of the appliances .
3. List the measurement units of voltage, current, resistance.
4. Study of series resistive circuits.
5. Study of parallel resistive circuits.
6. Verify the ohm's law by using ohm's experiment.
7. Verify the Kirchhoff's law by using experiment
8. Identify different types of resistors.
9. Connect the resistor in series and parallel combination and measure effective resistance

### **Unit – 2. Electric Cells & Capacitors**

1. Identify different types of capacitors.
2. Connect the capacitors in series and parallel combination and measure effective capacitance.
3. Demonstrate the charging and discharging of capacitor.
4. Study of series & parallel connection of cells .

### **Unit -3. Heating & Lighting effect of electric current**

1. Verification of Joule's law of heating .

### **Unit 4 . Electromagnetic Effects**

1. Demonstrate the experiment of magnetic attraction
2. Verify Faraday's law of electromagnetic induction
3. Identify different types of inductors.

### **Unit- 5. A. C. Circuits**

1. Study of R.L. series circuit and measurement of power and power factor.
2. Study of R.C. series circuit and measurement of power and power factor.
3. Demonstrate the experiment of series RLC.

**Employability Skills**

**Unit- 1 : Basic ICT Skills – III**

Introduction to word processing; Software packages for word processing; Opening and exiting the word processor; Creating a document; Editing text; Wrapping and aligning the text/ line. Insert pictures ,shaped , text box ,word art . Font size, type and face; Header and Footer; Auto correct; Numbering and bullet; Creating table; Find and replace; Page numbering; Printingdocument; Saving a document in various formats

**Unit – 2: Green Skills - III**

Main sectors of green economy- E-waste management, green transportation, renewal energy, green construction, water management; Policy initiatives for greening economy in India . Role of government and private agencies in greening cities, Industry , Renewable Energy , Forests and fisheries

**VOCATIONAL SKILLS**

**Unit -1 : Basic Electronics**

Relay, contractor and switches; Electronic components, Types of electronic components – activeand passive components; Color code of resistors; Color code of capacitors;

Measuring instruments – Multi- meter analog and digital, Measurement of AC, DC voltage and current using multi-meter.

Concept of semiconductor; PN Junction diode; Forward and reverse bias characteristics of PN junction diode; Testing of PN junction diodes using multimeter; Specialised diodes such as zener diode, light emitting diode, photo diode, Thermistor

Transistor biasing; Transistor amplifier; CE, CB and CC amplifiers; Power amplifier.

Rectifiers, half wave and full wave rectifiers; Regulated power supply using zener diode.

Introduction to digital electronics; Number systems, logic gates, arithmetic circuits

**Unit 2: Compressor Technology**

Definition of compressor; Functioning of compressor; Type of compressor – harmatic, semiharmatic, rotary, screw, scroll, direct drive, belt drive, centrifugal compressor, thermo compressor, wobble plate, swash plate.

Internal parts of compressor – stator winding, cylinder, piston, valve plate, suction rid, dischargerid; Various terms associated with reciprocating compressor – compression stroke, suction stroke, compression ratio, Top dead centre (TDC), Bottom dead centre (BDC), clearance pocket, bypass capacity control, volumetric efficiency, compression speed,capacity control methods.

Materials used for compressor components; Lubrication of compressor; Compressor efficiency; Factors affecting compressor efficiency

**Unit 3: Installation of Air Conditioner**

Definition of air conditioning; Requirement of air conditioning; Calculation of heat load; Tone of refrigeration and British Thermal Unit (BTU); Refrigeration cycle; Different types of AC; Various brands and models of AC; Different features and functionaries of various AC models; Energy

efficiency ratings (EER) of AC.

Definition of refrigerants; Characteristics of refrigerants; Safe economical and efficient refrigerants; Refrigerant numbering and color codes; Different types refrigerants such as R22, R32, R410, R600a, R134a, R290; Refrigerant cylinders and valves; Ozone layer and green houseeffect.

Different tools – tester, spanner, wrench, measuring tape, drill machine, pliers, hammer, hacksaw, pipe cutter, screw driver and testing equipment like clamp meter, voltmeter, and other installation and repair tools; Spare parts of AC; Concept of route plan for maximum target achievement.

Site visit for AC installation; Wiring diagram, wiring layout for installation; Types of wire to be used as per the current drawing capacity of air conditioner; Pre-installation arrangements; Installation of window and split AC as per the installation manual.

Test run; Various features of remote

Customer awareness about the product details, model, specification, functioning, warranty, replacement cost.

#### **Unit 4: Workplace Safety Measures**

Electrical earthing; Different hazards related to installation and repair of AC; Safety guidelines while installation and repair of AC; Workplace safety policies and general guidelines; Electrical safety guidelines by using proper personal protective equipment (PPE); Safety and protection equipment such as fire extinguisher, safety instrument and clothing; Basic first aid; Types of accident injury or hazard.

### **Paper – II(PRACTICAL) FULL Mark:-50**

#### **Employability Skills**

##### **Unit- 1 : Basic ICT Skills – III**

1. Demonstration and practice of the following:
  - i. Listing the features of word processing,
  - ii. Listing the software packages for word processing,
  - iii. Opening and exit the word processor,
  - iv. Creating a document

Demonstration and practicing the following:

- i . Editing the text,
- ii. Word wrapping and alignment,
- iii. Changing font type, size and face,
- iv. Inserting header and footer,
- v. Removing header and footer,
- vi. Using autocorrect option,
- vii. Insert page numbers and bullet,
- viii. Save and print a document

##### **Unit – 2: Green Skills - II**

- 1.Preparing a poster on any one of the sectors of green economy.
2. Writing a two-page essay on important initiatives taken in India for promoting greeneconomy

# VOCATIONAL SKILLS

## Unit -1 : Basic Electronics

1. Draw the symbol of the given relay, contractor and switches.
2. List the active and passive components and draw their symbols.
3. Determine the value of resistance by using color code.
4. Determine the value of capacitor by using color code.
5. Measure the given AC, DC voltage and current by using analog multi-meter.
6. Measure the given AC, DC voltage and current by using digital multi-meter.
7. Draw the symbol of PN junction diode and determine the name of terminals by observing the PN junction diode.
8. Test the continuity of given diode using multimeter.
9. Construct the circuit for forward and reverse bias of the diode and draw its characteristic curve.
10. Draw the characteristics curve of zener diode, light emitting diode, photo and diode.
11. Draw the symbols of NPN and PNP bipolar transistors.
12. Identify Base, Emitter and Collector terminals of the given transistor using multimeter.
13. Test the continuity of given transistor by using multimeter.
14. Draw the waveform of half wave rectifier and construct the circuit, measure input and output voltage.
15. Draw the waveform of full wave rectifier and construct the circuit, measure input and output voltage.
16. Convert the given decimal number into binary, octal and hexadecimal numbers.
17. Construct the circuit for AND, OR and NOT gate and verify its truth table.

## Unit 2: Compressor Technology

1. Identify the compressor.
2. Demonstrate the functioning of compressor.
3. Identify and list the types of compressor.
4. List the advantages and disadvantages of centrifugal compressor.
5. Demonstrate the Internal parts of compressor.
6. List the different terms associated with reciprocating compressor.
7. List the materials used in compressor.
8. Identify the types of lubricants used in compressor.
9. List the factors affecting compressor efficiency.
10. Identify and test terminal of harmonic compressor.

## Unit 3: Installation of Air Conditioner

1. Visit the shop or website of air conditioner and list the specifications, features and functions of various air conditioners.
2. Calculate the heat load of the given room size.
3. List the Energy efficiency ratings (EER) of various models of air conditioner.
4. Identify the refrigerants by using pressure gauge.

5. Identify the different refrigerants by using color codes.
6. Prepare a chart of refrigerant color codes.
7. Demonstrate the use of various tools required for installation and servicing of air conditioner.
8. Organise the tools and parts of AC to be taken at customer location.
9. Develop optimum route plan for maximum target achievement.
10. Perform site visit and gather the information for installation of AC.
11. Prepare wiring diagram as per the site requirement.
12. Identify the appropriate wire to be used for installation of given AC.
13. Demonstrate to install the split AC and window AC.
14. Demonstrate the test run.
15. Demonstrate the various features of remote to the customer
16. Retro fitting and safe handling of CFC and HCFC refrigerant

#### **Unit 4: Workplace Safety Measures**

1. Demonstrate to check electrical earthing.
2. Identify and list different hazards related to installation and repair of AC.
3. List and use the organisational safety guidelines while installation and repair of AC.
4. Demonstrate the use of proper personal protective equipment (PPE) for electrical safety.
5. Demonstrate the use of safety and protection equipment.
6. Demonstrate the use of first aid to provide the basic first aid.

#### **QUESTION PATTERN (For Theory Paper – I & Paper –II)**

Type of Question	Marks
1. Very short answer type (Multiple Choice Question )	1 mark X 5=5
2. Short answer type questions(any 10) (Answer in one word or sentence)	1 mark X 10=10
3. Short answer type questions(any 10) (Answer in two or three sentences)	2 marks X 10 =20
4. <u>Long answer type questions(any 3)</u>	<u>5 marks X 3=15</u>
<b>TOTAL</b>	<b>50</b>







# ELECTRONICS & HARDWARE

## Job Role – Field Technician Air Conditioner

Class-12		Paper- III		Full Mark- 100	
Part -A	Employability Skills	No. of Theory classes	No. of Practical Classes	Max mark	
Unit 1	Communication Skills – IV	08	15	10	
Unit 2	Self-management Skills – IV	05	09		
Unit 3	Entrepreneurial Skills – IV	05	09		
<b>Total</b>		<b>18</b>	<b>33</b>	<b>10</b>	
Part-B	Vocational Skill				
Unit - 1	Single phase Transformer	12	12	40	
Unit - 2	D.C. Machines	10	15		
Unit - 3	Three Phase Induction Motor	10	06		
Unit - 4	Single Phase A.C. Motors	10	15		
Unit - 5	Bimetallic Relay and Thermocouple	05	09		
<b>Total</b>		<b>47</b>	<b>57</b>	<b>40</b>	
Part-C	Practical Work				
	Practical Examination		06	15	
	Written test		01	10	
	Viva Voce		03	10	
<b>Total</b>			<b>10</b>	<b>35</b>	
Part-D	Project Work/ Field Visit				
	Practical File/ Student Port folio		10	10	
	Viva Voce		05	05	
<b>Total</b>			<b>15</b>	<b>15</b>	
<b>Grand Total</b>		<b>65</b>	<b>115</b>	<b>100</b>	

Class-12		Paper- IV		Full Mark- 100
Part -A	Employability Skills	No. of Theory classes	No. of Practical Classes	Max mark
Unit - 1	Basic ICT Skills – IV	10	27	10
Unit - 2	Green Skills – IV	08	12	
	<b>Total</b>	<b>18</b>	<b>39</b>	<b>10</b>
<b>Part-B</b>	<b>Vocational Skill</b>			
Unit -1	Repair and Maintenance of Air Conditioner	14	15	40
Unit -2	Advanced Technologies in Air Conditioning	08	13	
Unit -3	Troubleshooting IoT applications in Air Conditioner	12	15	
Unit -4	Workplace Safety Measures	9	12	
	<b>Theory</b>	<b>43</b>	<b>55</b>	<b>40</b>
<b>Part-C</b>	<b>Practical Work</b>			
	Practical Examination		06	15
	Written test		01	10
	Viva Voce		03	10
	<b>Total</b>		<b>10</b>	<b>35</b>
<b>Part-D</b>	<b>Project Work/ Field Visit</b>			
	Practical File/ Student Port folio		10	10
	Viva Voce		05	05
	<b>Total</b>		<b>15</b>	<b>15</b>
	<b>Grand Total</b>	<b>61</b>	<b>119</b>	<b>100</b>

• **PAPER –III (THEORY) FULL MARK: 50**

**Employability Skill**

**Unit 1: Communication Skills – IV**

- Importance of active listening at workplace.
- Steps to active listening.

**Unit 2: Self-management Skills – IV**

- Finding and listing motives (needs and desires)

- Finding sources of motivation and inspiration (music, books, activities); expansive thoughts; living fully in the present moment; dreaming big.
- Describe the meaning of personality.
- Describe how personality influence others.
- Describe basic personality traits.

### **Unit 3: Entrepreneurial Skills – IV**

- Barriers to becoming entrepreneur.
- Entrepreneurial competency in particular: Self-confidence, initiative, seeing and acting on opportunities, concern for quality, goal setting and risk taking, problem solving and creativity, systematic planning and efficiency, Team bulding.

## **VOCATIONAL SKILLS**

### **Unit I: Single phase Transformer:**

Working principles and Construction, Components, auxiliary parts i.e breather, conservator. buchholze relay, Explosion vent, temperature gauge, Tap changer, etc. Types of transformer - step-up and step-down transformer, voltage and current transformer, auto- transformer. E.M.F equation and transformation ratio of transformer. Losses in transformers and methods of reduces the losses. Applications of different types of transformers.

### **Unit-II: D.C. Machines:**

General concept of electrical machines i.e Generator and Motor. D.C. Generator- working principle & emf equation, construction- Armature, field coil, polarity, yoke, cooling fan, commutator, slip ring, brushes, laminated core etc. Types of motor - series, shunt, compound and universal, construction, working principles, winding details and applications of different types of motors, starting and starters for D.C Motors. Installation of D.C motor and testing, speed reversal and speed control of D.C motors, Common faults, their causes, testing and repairs.

### **Unit-III: Three Phase Induction Motor**

Working principle -Production of rotating magnetic field, Squirrel Cage Induction motor, Slip-ring induction motor. Construction, and Speed control, Slip & Torque. Control & Power circuit of starters D.O.L Starter, Star Delta starter, Autotransformer starter, Rotor resistance starter (Qualitative idea only). Application of Induction Motor.

### **Unit-IV: Single Phase A.C. Motors**

Types of A.C Motors - induction motor, Capacitor motor, shaded pole motor, universal motor, construction, working principles, winding details and applications of different types of motors. Starting and starters for different motors. Speed reversal and speed control of A.C Motors, Installation of A.C motor and testing, common faults, their causes, testing and repairs.

### **UNIT-V: Bimetallic Relay and Thermocouple**

Construction and application of Bimetallic Relay and Thermocouples for control of temperature and current.

## **Employability Skills**

### **Unit 1: Communication Skills – IV**

1. Demonstration of the key aspects of becoming active listener.
2. Preparing posters of steps for active listening.

### **Unit -2: Self-management skill-IV**

1. Group discussion on identifying needs and desire.
2. Discussion on sources of motivation and inspiratio

### **Unit 3: Entrepreneurial Skills – IV**

1. Administering self-rating questionnaire and score responses on each of the competencies.
2. Collect small story/ anecdote of prominent successful entrepreneurs.
3. Games and exercises on changing entrepreneurial behavior and development of competencies for enhancing self-confidence, problem solving, goal setting, information seeking, team building and creativity.

## **VOCATIONAL SKILLS**

1. Study of Voltage transformer.
2. Study of Current Transformer.
3. Study of AutoTransformer.
4. Dismantling, study and reassembling of a D.C motor.
5. Measurement of resistance of series, shunt field and armature of a given D.C motor and identification of terminals by multi meter.
6. Measurement of insulation resistance of armature and field.
7. Testing, fault finding and repair of a d.c. motor.
8. Overhauling of a d.c. motor.
9. To study d.c. series motor, its running, speed control and reversing rotation and measurement of current, voltage and speed.
10. To study d.c. shunt motor, its running, speed control and reversing rotation and measurement of current, voltage and speed.
11. To study d.c. compound motor, its running, speed control and reversing rotation and measurement of current, voltage and speed.
12. To study d.c. universal motor, its running, speed control and reversing rotation and measurement of current, voltage and speed.
13. Overhauling of an AC motor.
14. Connecting, starting, running of a shaded pole motor.
15. Connecting, starting, running and reversing of a capacitor start/run motor.
16. Connecting, starting, running and reversing of an AC Universal motor.
17. Installation of D.C motor.
18. Installation of AC motor.
19. Study of Bimetallic Relay and use it for controlling temperature.
20. Study of thermocouple.

## **Paper – IV(Theory)      FULL Mark:-50**

### **Employability Skills**

#### **Unit 1: Basic ICT Skills – IV**

Introduction to spreadsheet application, Spread sheet applications, Creating a new worksheet, Opening workbook and entering text, Resizing fonts and styles, Copying and moving, Formulas and functions, Password protection, Printing a spreadsheet, Saving a spreadsheet in various formats. Password protection, printing a spread sheet, saving a spreadsheet in various formats. Introduction to presentation, Software packages for presentation, Creating a new presentation, Adding a slide, Deleting a slide, Entering and editing text, Formatting text, Inserting clipart and images, Slide layout, Saving a presentation, Printing a presentation document.

#### **Unit 2: Green Skills – IV**

Role of green jobs in toxin-free homes. Green organic gardening, public transport and energy conservation, Green jobs in water conservation. Green jobs in green tourism Green jobs in building and construction, Green jobs in appropriate technology, Role of green jobs in Improving energy and raw materials use, Role of green jobs in limiting greenhouse gas emissions, Role of green jobs minimizing waste and pollution ,Role of green jobs in protecting and restoring ecosystems, Role of green jobs in support adaptation to the effects of climate change.

### **VOCATIONAL SKILLS**

#### **Unit 1: Repair and Maintenance of Air Conditioner**

Preventive maintenance of AC– filter, power chords, indoor unit, outdoor unit, switches. Fault finding using customer interaction, Initial inspection, Symptom, history of problem, age of appliance, status of upkeep. Process for checking the electronic components of AC like compressor, capacitor, fan motor, blower motor, PCB or control panel.

Testing equipment – clamp meter, pressure gauge. Tools for repair and servicing – Wiring accessories, Tube cutter, Tube binder, Flaring tool, Brazing torch, Vacuum pump, Weight scale, Gas cylinder, Temperature meter, etc.

Some common problems, their possible causes and remedy of AC such as – unit not working, fuse off, low cooling, fan not working, fan working but not cooling, continuous switching on and of the unit. Repairing of remote – sensor problem, push button pad problem. Procedure for repairing of different components such as fan, PCB, air sensor, grill sensor, brazing in case gas leak. Checking the functionality of repair components .

#### **Unit 2: Advanced Technologies in Air Conditioning**

Internet technology. Internet of things (IoT) technology. App controlled of AC using smart phone. Use of micro controller and sensors Fuzzy logic technology.

Dual inverter technology. Concept of air curtain fan. Concept of smart cooling. Slim size air conditioners. Fourdimensional air flow with wider angle. Concept of acoustic jacket. Auto clean technology. Protection from voltage fluctuations. Protection from protect, Leakage Protection from fire, Fast cooling technology, Efficient cooling technology.

### **Unit 3: Troubleshooting IoT applications in Air Conditioner**

Common problem in IoT application, List of error codes of related issues, Software issues – Internet connection, wi-fi, Bluetooth version compatibility, Trouble shooting software issues, Steps to resolve software issues, Software setting – Update software and network setting.

Hardware issues - IoT circuit board, sensor, power connection, network cable. Steps for troubleshooting hardware issues. Steps to replace the faulty sensor and circuit board. Mobile app for checking the functionality. Various functions in mobile app, Trouble shooting through mobile app.

### **Unit 4: Workplace Safety Measures**

Refrigerant cylinder – Handling and storage. Precautions in safe handling. Effect of moisture. Use of recovery unit. Prevention of HFC become flammable.

Vacuum pump and leak detector. Micron gauge. Manifold gauge in charging hoses. Safety by using power tool.

## **Paper – IV(PRACTICAL)**

**FULL Mark: -50**

### **Employability Skills**

#### **Unit 1: Basic ICT Skills – IV**

1. Introduction to the spreadsheet application.
2. Listing the spreadsheet applications,
3. Creating a new worksheet.
4. Opening the workbook and enter text.
5. Resizing fonts and styles, Copy and move the cell data.
6. Applying elementary formulas and functions, Protecting the spreadsheet with password.
7. Printing a spreadsheet, Saving the spreadsheet in various formats
8. List the software packages with features for presentation
9. Creating a new presentation.
10. Adding a slide to presentation.

#### **Unit 3: Green Skills – IV**

1. Listing of green jobs and preparation of posters on green job profiles.
2. Prepare posters on green jobs.

# VOCATIONAL SKILLS

## Unit 1: Repair and Maintenance of Air Conditioner

1. Demonstrate the different preventive measure required for maintenance of AC.
2. List and resolve the common faults in AC, Check the various electronic components of AC like compressor, capacitor, fan motor, blower motor, PCB or control panel.
3. Demonstrate the starting and running method of testing the compressor.
4. Demonstrate the use of various test equipment for testing.
5. Demonstrate the use of tools for repairing.
6. Identify and list the common problems, their possible causes and remedy of AC.
7. Repairing of remote.
8. Carry out repairing of different components.

## Unit 2: Advanced Technologies in Air Conditioning

1. Establish the device connectivity to the wireless network using Internet technology.
2. Demonstrate the different functionalities of App.
3. Demonstrate the use of micro controller and sensors.
4. Demonstrate the effect of cooling by using Fuzzy logic technology.
5. List various advanced technologies and their advantages.

## Unit 3: Troubleshooting IoT applications in Air Conditioner

1. Demonstrate the troubleshooting of the product through mobile app.
2. Prepare a chart of error codes their cause and remedies.
3. Identify the issue and rectify the faulty sensor and circuit board.
4. Demonstrate the updation of software.
5. Demonstrate the network setting in the installed software.
6. Identify and list the different cables and connectors use in the network connectivity.
7. List the common hardware issues
8. Troubleshooting the common hardware issues
9. Identify and replace the faulty sensor and circuit board
10. Checking the functionality using mobile app
11. Demonstrate the air conditioner control using mobile app.

## Unit 4: Workplace Safety Measures

1. Demonstrate the safe handling of refrigerant cylinder.
2. List the precautionary measures needed for safety of refrigerant.
3. Demonstrate the safe handling of tools.

**QUESTION PATTERN (For Theory Paper – I & Paper –II)**

Type of Question	Marks
1. Very short answer type (Multiple Choice Question )	1 mark X 5=5
2. Short answer type questions(any 10) (Answer in one word or sentence)	1 mark X 10=10
3. Short answer type questions(any 10) (Answer in two or three sentences)	2 marks X 10 =20
4. Long answer type questions(any 3)	5 marks X 3=15
<b>TOTAL</b>	<b>50</b>

Reference book -

- 1.Nimi Book (Refrigeration and Air Conditioning) NSQF- 4
2. Refrigeration and air conditioning
3. Asian publication