

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		
Total		18	39	10	
Part-B	Vocational Skill (Basic Electricity)				
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		
Total		43	55	40	
Part-C	Practical Work				
	Practical Examination		06	15	
	Written test		01	10	
	Viva Voce		03	10	
Total			10	35	
Part-D	Project Work/ Field Visit				
	Practical File/ Student Port folio		10	10	
	Viva Voce		05	05	
Total			15	15	
Grand Total		61	119	100	

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	
	Total	18	39	10
Part-B	Vocational Skill			
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	
	Theory	43	55	40
Part-C	Practical Work			
	Practical Examination		06	15
	Written test		01	10
	Viva Voce		03	10
	Total		10	35
Part-D	Project Work/ Field Visit			
	Practical File/ Student Portfolio		10	10
	Viva Voce		05	05
	Total		15	15
	Grand Total	61	119	100

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, Kirchhoff'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>
TOTAL	50

