

### **Plan of Written Examination**

All the aspirants are informed as under with respect to the written test to be conducted for the recruitment of **Incubator Operator**

- (i) The Exam will be conducted in MCQ (Multiple Choice Questions) format. OMR sheets will be used for answering the questions.
- (ii) There will be negative marking. Each question carries 1 mark. **For every wrong answer, 1/4<sup>th</sup> mark would be deducted. The question(s) not attempted will receive no credit or discredit.**
- (iii) The test would be of 2 hours duration.
- iv) Pattern of the written competitive examination is as follows:-

Sr. No.	Topic	No. of Questions	Marks (Each Question carries 1 mark)	Type of Questions
1.	Questions from the Subject (Part A of Syllabus)	90	90	MCQs (Multiple Choice Questions)
2.	Questions from General Knowledge, English, Punjabi, Logical Reasoning and Mental ability (Part B of Syllabus)	30	30	
<b>Total</b>		<b>120</b>	<b>120</b>	

- v) Tentative syllabus for the written examination for the recruitment of **Incubator Operator** is annexed at Annexure-1 and 2.

## Annexure-I

### Part A-Subject Syllabus (Incubator Operator)

1.
  - Safety rules and safety signs.
  - Types and working of fire extinguishers.
  - First aid safety practice. Personal safety and factory safety.
  - Response to emergencies e.g. power failure, system failure and fire etc.
2.
  - Concept of Standards and advantages of BIS/ISI.
  - Trade tools specifications. Description of files, hammers, chisels hacksaw frames, blades, their specification and grades.
  - Marking tools description and use.
  - Types of drills, description & drilling machines Various wooden joints.
  - Marking tools; calipers Dividers, Surface plates, Angle plates, Scribes, punches, surface gauges Types, Uses, Care and maintenance.
  - Sheet metal tools: Description of marking & cutting tools. Types of rivets and riveted joints.
  - Use of thread gauge.
  - Description of carpenter's tools Care and maintenance of tools.
3.
  - Fundamentals of electricity, definitions, units & effects of electric current. Conductors and insulators. Conducting materials and their comparison.
  - Joints in electrical conductors. Techniques of soldering.
  - Types of solders and flux.
  - Underground cables: Description, types, various joints and testing procedure. Cable insulation & voltage grades Precautions in using various types of cables.
4.
  - Ohm's Law; Simple electrical circuits and problems. Kirchoff's Laws and applications.
  - Series and parallel circuits. Open and short circuits in series and parallel networks.
  - Laws of Resistance and various types of resistors.
  - Wheatstone bridge; principle and its applications.
  - Series and parallel combinations of resistors.
  - Magnetic terms, magnetic materials and properties of magnet.
  - Principles and laws of electro-magnetism.
  - Self and mutually induced EMFs.
  - Inductive and capacitive reactance, their effect on AC circuit and related vector concepts.
  - Comparison and Advantages of DC and AC systems.
  - Instantaneous value, R.M.S. value Average value, Peak factor, form factor, power factor and Impedance etc. Sine wave, phase and phase difference.
5.
  - Chemical effect of electric current and Laws of electrolysis.

- Explanation of Anodes and cathodes.
  - Types of cells, advantages / disadvantages and their applications.
  - Lead acid cell; Principle of operation and components.
  - Types of battery charging, Safety precautions, test equipment and maintenance.
  - Basic principles of Electroplating and cathodic protection
  - Grouping of cells for specified voltage and current.
  - Principle and operation of solar cell.
- 6.
- Types of domestic and industrial wirings.
  - Study of wiring accessories e.g. switches, fuses, relays, MCB, ELCB, MCCB etc.
  - Grading of cables and current ratings.
  - Principle of laying out of domestic wiring.
  - PVC conduit and Casing-capping
  - Different types of wiring system.
  - Planning, permissible load in sub circuit and main circuit.
  - Estimation of load, cable size, bill of material and cost.
  - Inspection and testing of wiring installations.
  - Special wiring circuit e.g. godown, tunnel and workshop etc.
- 7.
- Importance of Earthing. Plate earthing and pipe earthing methods and IEE regulations.
  - Earth resistance and earth leakage circuit breaker.
- 8.
- Laws of Illuminations.
  - Types of illumination system.
  - Type of lamps, advantages/ disadvantages and their applications.
  - Calculations of lumens and efficiency.
- 9.
- Classification of electrical instruments and essential forces required in indicating instruments.
  - PMMC and Moving iron instruments.
  - Measurement of various electrical parameters using different analog and digital instruments.
  - Measurement of energy in three phase circuit.
- 10.
- Loading effect of voltmeter and voltage drop effect of ammeter in circuits.
  - Extension of range and calibration of measuring instruments.
- 11.
- Working principles and circuits of common domestic equipment and appliances.
  - Concept of Neutral and Earth.
  - Working principle, construction and classification of transformer.
  - Single phase and three phase transformers.
  - Series and parallel operation of transformer.
  - Voltage Regulation and efficiency.

- Auto Transformer and instrument transformers (CT & PT).
  - Method of connecting three single phase transformers for three phase operation.
  - Types of Cooling, protective devices, bushings and termination etc.
  - Testing of transformer oil.
  - Materials used for winding and winding wires in small transformer.
- 12.
- General concept of rotating electrical machines.
  - Principle of DC generator.
  - Use of Armature, Field Coil, Polarity, Yoke, Cooling Fan, Commutator, slip ring and Brushes, Laminated core etc.
  - E.M.F. equation
  - Separately excited and self excited generators.
  - Series, shunt and compound generators
- 13.
- Armature reaction, Commutation, inter poles and connection of inter poles.
  - Parallel Operation of DC Generators.
  - Load characteristics of DC generators.
  - Application, losses & efficiency of DC Generators.
  - Principle and types of DC motor.
  - Relation between applied voltage back e.m.f., armature voltage drop, speed and flux of DC motor.
- 14.
- Methods of speed control of DC motors. Lap and wave winding and related terms.
  - Working principle of three phase induction motor.
  - Squirrel Cage Induction motor, Slip-ring construction, characteristics, Slip and Torque.
  - Different types of starters for three phase induction motor.
  - No load test and blocked rotor
  - Various methods of speed control.
  - Braking system of motor. Maintenance and repair.
- 15.
- Concentric/ distributed, single/ double layer winding and related terms
  - Working principle, different method of starting and running of various single phase AC motors.
  - Domestic and industrial applications of different single phase AC motors.
  - Principle of alternator, e.m.f. equation, relation between poles, speed and frequency.
  - Types and construction.
  - Efficiency, characteristics, regulation, phase sequence and regulation, phase sequence and parallel operation.
  - Rotary Converter, MG Set description and Maintenance.
- 16.
- Resistors – colour code, types and characteristics.
  - Active and passive components.
  - Atomic structure and semiconductor theory.

- P-N junction, classification, specifications, biasing and characteristics of diodes.
  - Rectifier circuit - half wave, full wave, bridge rectifiers and filters.
  - Principle of operation, types, characteristics and various configuration of transistor.
  - Application of transistor as a switch, voltage regulator and amplifier.
  - Basic concept of power electronics devices.
  - IC voltage regulators
  - Digital Electronics – Binary numbers, logic gates and combinational circuits.
  - Working principle and uses of oscilloscope.
  - Construction and working of SCR, DIAC, TRIAC and IGBT.
  - Principle, types and applications of various multivibrators.
- 17.
- Study and understand Layout drawing of control cabinet, power and control circuits.
  - Various control elements: Isolators, pushbuttons, switches, indicators, MCB, fuses, relays, timers and limit switches etc.
  - Wiring accessories: Race ways/cable channel, DIN rail, terminal connectors, thimbles, lugs, ferrules, cable binding strap, buttons, cable ties, sleeves, gromats and clips etc.
  - Testing of various control elements and circuits.
- 18.
- Working, parameters and applications of AC / DC drive.
  - Speed control of 3 phase induction motor by using VVVF/AC Drive.
  - Basic concept, block diagram and working of voltage stabilizer, battery charger, emergency light, inverter and UPS.
  - Preventive and breakdown maintenance.
- 19.
- Conventional and nonconventional sources of energy and their comparison.
  - Power generation by thermal and hydel power plants.
- 20.
- Various ways of electrical power generation by non-conventional methods.
  - Power generation by solar and wind energy.
  - Principle and operation of solar panel.
- 21.
- Transmission and distribution networks.
  - Line insulators, overhead poles and method of joining aluminum conductors.

## Annexure-2

## Part B--General Knowledge, English, Punjabi, Logical Reasoning and Mental Ability.

Sr. No.	Indicative Contents of Syllabus	Weightage (Approx.)
1	<p><b>General Knowledge and Current affairs of National and International importance including:</b></p> <p>(i) Political issues,  (ii) Environment issues,  (iii) Current Affairs,  (iv) Science and Technology,  (v) Economic issues,  (vi) History of India with special reference to Indian freedom struggle movement.  (vii) Sports,  (viii) Cinema and Literature.</p>	10
2	<p><b>Logical Reasoning &amp; Mental Ability:</b></p> <p>Verbal Reasoning: Coding, Decoding, Analogy, Classification, Series, Direction sense test, relations, mathematical operations, time test, odd man out problems.</p> <p>Non Verbal Reasoning: Series, Analogy and Classification.</p> <p>Basic numerical skills, Percentage, Number system, LCM and HCF, Ratio and Proportion, Number series, Average, Problems based on Ages, Profit &amp; Loss, Partnership and Mixture, Simple and Compound Interest, Work and Time, Time and Distance, Mensuration and Data Interpretation.</p>	10
3	<p><b>English:-</b></p> <p>Basic Grammar, Subject and Verb, Adjectives and Adverbs, Synonyms, Antonyms, One Word Substitution, Fill in the Blanks, Correction in Sentences, Idioms and their meanings, Spell Checks, Adjectives, Articles, Prepositions, Direct and Indirect Speech, Active and Passive Voice, Correction in Sentences, etc.</p>	5
4	<p><b>ਪੰਜਾਬੀ:-</b></p> <p>ਸੁੱਧ-ਅਸੁੱਧ, ਸ਼ਬਦ ਜੋੜ, ਅਗੇਤਰ ਅਤੇ ਪਿਛੇਤਰ, ਸਮਾਨਾਰਥਕ/</p>	5

	ਵਿਰੋਧੀ ਸ਼ਬਦ, ਨਾਂਵ, ਪੜਨਾਂਵ ਅਤੇ ਕਿਰਿਆ ਦੀਆਂ ਕਿਸਮਾਂ ਤੇ ਸਹੀ ਵਰਤੋਂ, ਲਿੰਗ ਅਤੇ ਵਚਨ, ਪੰਜਾਬੀ ਅਖਾਣ ਤੇ ਮੁਹਾਵਰੇ, ਅੰਗਰੇਜ਼ੀ ਤੋਂ ਪੰਜਾਬੀ ਅਨੁਵਾਦ ਅਤੇ ਬਹੁਤੇ ਸ਼ਬਦਾਂ ਦੀ ਥਾਂ ਇੱਕ ਸ਼ਬਦ ਆਦਿ।	
	<b>Maximum Marks</b>	30

Note:-a) The distribution of marks/question in each section is indicative. It may vary slightly.

b) The syllabus is broadly classified as above but may vary to some extent.

