



## HPCL RAJASTHAN REFINERY LIMITED

Joint Venture between Hindustan Petroleum Corporation Limited (HPCL)  
and Government of Rajasthan.

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Jaipur, Rajasthan, India 302005

CIN No.U23201RJ2013GOI043865

Advt. No - HRRL/RECT/02/2025

### **Computer Based Test (CBT) for Assistant Engineer – Electrical : S/G E1**

As per Advt. No - HRRL/RECT/02/2025 clause no. 7 (mentioned in page 51), the syllabus for Assistant Engineer – Electrical : S/G E1 is given as below.

**Duration: 2 hours**

**Total Marks: 100**

All questions of the Computer Based Test (CBT) will be objective and multiple-choice type. Total number of questions in the CBT are 100. Each correct answer carries 1 mark and there is no **negative** marking for wrong answers.

### **Syllabus**

**Part-1: General Aptitude (Graduate – Level)**

**(30 Marks)**

#### **1. Intellectual Potential Test:**

- Distance
- Syllogism
- Logical Operations
- Similarities and dissimilarities
- Verbal Comprehension
- Perpetual Reasoning
- Working Memory
- Processing Speed
- Fluid reasoning

#### **2. Logical Reasoning & Data interpretation**

- Seating arrangements and puzzles
- Series – verbal and number
- Relationships
- Coding-decoding

- Verbal and numerical Analogy
- Binary Logic
- Games and Tournaments
- Arrangements
- Team Formations
- Order and Ranking
- Table, Data Caselets – Reasoning-Based DI, 3. Column Graphs, Bar Graphs, Line Charts, Pie Charts, Routes and Network

### 3. Quantitative Aptitude

The test of QA may cover Number systems including questions on simplification, decimals, fraction, LCM and HCF, square root, divisibility test, Ratio & proportion, Percentage, Average, Profit & loss, Discount, Simple and compound interest, Mensuration, Time & Work, Time and distance, Algebraic identities, Problems on Age, Tables & Graphs etc.

### 4. English Language

Program	Education Level	Course	Subject	Topic	Sub Topic	Concept / Type
General Aptitude	HSC	General Verbal Ability - English	Grammar - English	Question Tags	Negative question tag	Sentence Completion
General Aptitude	HSC	General Verbal Ability - English	Grammar - English	Question Tags	Positive question tag	Sentence Completion
General Aptitude	HSC	General Verbal Ability - English	Grammar - English	Parts of speech	Adjective	Sentence Completion
General Aptitude	HSC	General Verbal Ability - English	Grammar - English	Parts of speech	Adverb	Sentence Completion
General Aptitude	HSC	General Verbal Ability - English	Grammar - English	Parts of speech	Prepositions	Sentence Completion
General Aptitude	HSC	General Verbal Ability - English	Grammar - English	Parts of speech	Conjunctions	Sentence Completion
General	HSC	General	Grammar	Parts of	Verb	Sentence

<b>Aptitude</b>		Verbal Ability - English	- English	speech		Completion
<b>General Aptitude</b>	HSC	General Verbal Ability - English	Indirect Writing - English	Prose	Syntax and structure	Para Jumbles
<b>General Aptitude</b>	HSC	General Verbal Ability - English	Indirect Writing - English	Sentences	Word Usage and Understanding	One word substitution
<b>General Aptitude</b>	HSC	General Verbal Ability - English	Reading Comprehension - English	Passage	Appropriate Title	Identify the suitable title for the passage
<b>General Aptitude</b>	HSC	General Verbal Ability - English	Reading Comprehension - English	Passage	Central theme of the passage	Identify the central theme of the passage
<b>General Aptitude</b>	HSC	General Verbal Ability - English	Reading Comprehension - English	Passage	Facts	Identify the facts given in the passage
<b>General Aptitude</b>	HSC	General Verbal Ability - English	Reading Comprehension - English	Passage	Inferences drawn	Identify the inferences drawn from the passage
<b>General Aptitude</b>	HSC	General Verbal Ability - English	Reading Comprehension - English	Passage	Structure of the passage	Identify the structure of the passage
<b>General Aptitude</b>	HSC	General Verbal Ability - English	Reading Comprehension - English	Passage	Summary	Select the correct summary for the passage
<b>General Aptitude</b>	HSC	General Verbal Ability - English	Reading Comprehension - English	Passage	Text to World connection	The most appropriate connection to the real-life situations
<b>General Aptitude</b>	HSC	General Verbal Ability - English	Reading Comprehension - English	Passage	Tone of the passage	Identify the tone of the passage

<b>General Aptitude</b>	HSC	General Verbal Ability - English	Reading Comprehension - English	Passage	Vocabulary	Antonyms of the word
<b>General Aptitude</b>	HSC	General Verbal Ability - English	Reading Comprehension - English	Passage	Vocabulary	Correct usage of the word in other examples
<b>General Aptitude</b>	HSC	General Verbal Ability - English	Reading Comprehension - English	Passage	Vocabulary	Synonyms of the word
<b>General Aptitude</b>	HSC	General Verbal Ability - English	Reading Comprehension - English	Passage	Vocabulary	Word meaning
<b>General Aptitude</b>	HSC	General Verbal Ability - English	Vocabulary - English	Idioms and Phrases	Idioms	Word-segment substitution
<b>General Aptitude</b>	HSC	General Verbal Ability - English	Vocabulary - English	Idioms and Phrases	Proverbs	Word-segment substitution
<b>General Aptitude</b>	HSC	General Verbal Ability - English	Vocabulary - English	Semantics	Antonyms	Identification of antonym in a sentence
<b>General Aptitude</b>	HSC	General Verbal Ability - English	Vocabulary - English	Semantics	Synonyms	Word meaning in sentence

## Part 2: Technical/Professional Knowledge

(70 Marks)

### 1. Electric circuits

- Network elements: R, L, C, M elements; Network solution methods: KCL, KVL, Node and Mesh analysis; Transient response of dc and ac networks, sinusoidal steady-state analysis, resonance, balanced three phase circuits, star-delta transformation, complex power and power factor in ac circuits.

### 2. Electromagnetic Fields

- Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss's Law, Divergence, Electric field and potential due to point, line, plane and spherical charge distributions, Effect of dielectric medium, Capacitance of simple configurations, Ampere's law, Curl, Faraday's law, Lorentz force, Inductance, Magnetomotive force, Reluctance, Magnetic circuits, Self and Mutual inductance of simple configurations.

### 3. Electrical Machines

- Single phase transformer: equivalent circuit, phasor diagram, open circuit and short circuit tests, regulation and efficiency; Three-phase transformers: connections, vector groups, parallel operation; Auto-transformer, Electromechanical energy conversion principles; DC machines: separately excited, series and shunt, motoring and generating mode of operation and their characteristics, speed control of dc motors; Three-phase induction machines: principle of operation, types, performance, torque-speed characteristics, no-load and blocked-rotor tests, equivalent circuit, starting and speed control; Operating principle of single-phase induction motors; Synchronous machines: cylindrical and salient pole machines, performance and characteristics, regulation and parallel operation of generators, starting of synchronous motors; Types of losses and efficiency calculations of electric machines.

### 4. Power Systems

- Basic concepts of electrical power generation, ac and dc transmission concepts, Models and performance of transmission lines and cables, Series and shunt compensation, Electric field distribution and insulators, Distribution systems, Per-unit quantities, load flow methods, Voltage and Frequency control, Power factor correction, Symmetrical components, Symmetrical and unsymmetrical fault analysis, Principles of over-current, differential, directional and distance protection; Circuit breakers, System stability concepts.

### 5. Electrical and Electronic Measurements

- Bridges and Potentiometers, Measurement of voltage, current, power, energy and power factor; Instrument transformers, Digital voltmeters and multimeters, Phase, Time and Frequency measurement; Oscilloscopes, Error analysis.

## 6. Power Electronics

- Static V-I characteristics and firing/gating circuits for Thyristor, MOSFET, IGBT; DC to DC conversion: Buck, Boost and Buck-Boost Converters; Single and three-phase configuration of uncontrolled rectifiers; Voltage and Current commutated Thyristor based converters; Bidirectional ac to dc voltage source converters; Magnitude and Phase of line current harmonics for uncontrolled and thyristor based converters; Power factor and Distortion Factor of ac to dc converters; Single-phase and three-phase voltage and current source inverters, sinusoidal pulse width modulation.

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**NOTE: The syllabus/topics mentioned are indicative in nature. Candidates are expected to possess significant knowledge/proficiency pertaining to the relevant subjects and their qualifying degree.**