



**PUNJAB PUBLIC SERVICE COMMISSION**  
**BARADARI GARDENS, PATIALA-147001**  
**Website: [www.ppsc.gov.in](http://www.ppsc.gov.in)**

**RECRUITMENT FOR THE POSTS OF SUB DIVISIONAL ENGINEERS**  
**(ELECTRICAL) IN THE DEPARTMENT OF PUBLIC WORKS (B&R),**  
**GOVT. OF PUNJAB**

1.0 This is for information of the candidates who have applied for the posts of Sub Divisional Engineers (Electrical) in the Department of Public Works (B&R), Govt. of Punjab that a screening test for recruitment to these posts shall be conducted as per the following schedule :-

**Date : 10<sup>th</sup> February, 2013 (SUNDAY)**  
**Time : 11:00 A.M. to 12: 30 P.M.**

2.0 The examination centre shall be in Patiala and information of the same shall be mentioned on Admit Cards of all candidates. Details regarding the Admit cards shall be given shortly on the website of the Commission.

3.0 The list of eligible and ineligible candidates shall be uploaded shortly on the Commission's website [www.ppsc.gov.in](http://www.ppsc.gov.in).

4.0 The salient features of the screening test shall be as follows:-

(a) The test will consist of 100 objective type multiple choice questions ( 100 Marks).

(i) 50 questions will be of General Ability (50 Marks).

(ii) 50 questions will be of Electrical Engineering and related concepts (50 Marks).

(b) The duration of test will be 90 minutes.

(c) Level of the questions will be of graduation standard.

(d) All questions will carry equal marks.

(e) There will be no negative marking.

(f) The marks obtained in the Screening test shall be counted in the final merit list.

4.0 The paper of General Ability and Electrical Engineering will include questions covering the following broad fields of knowledge:-

**(A) GENERAL ABILITY (50 Marks)**

- (i) General awareness about the State- Punjab
- (ii) Indian Society, History & Culture, Polity, Economy, Human Development Indices and the Development Programmes;
- (iii) Everyday science and recent trends in Science and Technology,
- (iv) Basic concepts of Ecology and Environment;
- (v) Current Affairs of National and International importance

**B) ELECTRICAL ENGINEERING (50 Marks)**

**Electrical Circuits—Theory and Applications:**

Circuit components, network graphs, KCL, KVL; circuit analysis methods: nodal analysis, mesh analysis; basic network theorems and applications; transient analysis: RL, RC and RLC circuits; sinusoidal steady state analysis; resonant circuits and applications; coupled circuits and applications; balanced 3-phase circuits. Two port networks, driving point and transfer functions; poles and zeros of network functions.

**Signals & Systems:**

Representation of continuous-time and discrete-time signals & systems; LTI systems; convolution; impulse response; time-domain analysis of LTI systems based on convolution and differential/difference equations. Fourier transform, Laplace transform, Z-transform, Transfer function. Sampling and recovery of signals.

**Control Systems:**

Elements of control systems; block-diagram representations; open-loop & closed-loop systems; principles and applications of feed-back. LTI systems : time domain and transform domain analysis. Stability : Routh Hurwitz criterion, root-loci, Nyquist's criterion Bode-plots, Design of lead-lag compensators; Proportional, PI, PID controllers.

## **E-M Theory :**

Electro-static and magneto-static fields; Maxwell's equations; e.m. waves and wave equations; wave propagation and antennas; transmission lines; micro-wave resonators, cavities and wave guides.

## **Electrical Engineering Materials:**

Electrical/electronic behaviour of materials: conductivity; free-electrons and bandtheory; intrinsic and extrinsic semi-conductor, p-n junction; solar cells, super-conductivity. Dielectric behaviour of materials: polarization phenomena; piezo-electric phenomena. Magnetic materials: behaviours and application.

## **Analog Electronics:**

Diode circuits: Rectifiers filters, clipping and clamping, zener diode and voltage regulation. Bipolar and field effect transistors (BJT, JFET and MOSFET) : Characteristics, biasing and small signal equivalent circuits. Basic amplifier circuits; differential amplifier circuits. Amplifiers: analysis, frequency response. Principles of feedback; OPAMP circuits; filters; oscillators.

## **Digital Electronics:**

Boolean algebra; minimisation of Boolean functions; logic gates, digital IC families (DTL, TTL, ECL, MOS, CMOS). Combinational circuits : arithmetic circuits, code converters, multiplexers and decoder's. Sequential circuits : latches and flip-flops, counters and shift-registers. Comparators, timers, multivibrators. Sample and hold circuits; ADCs and DACs. Semi-conductor memories.

## **Communication Systems:**

Fourier analysis of signals : amplitude, phase and power spectrum, auto-correlation and cross-correlation and their Fourier transforms. Analog modulation systems : amplitude and angle modulation and demodulation systems, spectral analysis; superheterodyne receivers. Pulse code modulation (PCM), differential PCM, delta modulation. Digital modulation schemes : amplitude, phase and frequency shift

keying schemes (ASK, PSK, FSK). Multiplexing : time-division, frequency-division. Additive Gaussian noise : characterization using correlation, probability density function, power spectral density, Signal-to-noise ratio calculations for AM and FM. Elements of digital communication systems : source coding, channel coding; digital modulation & demodulation. Elements of Information theory, channel capacity. Elements of satellite and mobile communication; principles of television engineering; radar engineering and radio aids to navigation.

### **Computers and Microprocessors:**

Computer organization: number representation and arithmetic, functional organization, machine instructions, addressing modes, ALU, hardwired and microprogrammed control, memory organization. Elements of microprocessors. 8-bit microprocessors -architecture, instruction set, assembly level programming, memory, I/O interfacing, microcontrollers and applications.

### **Measurement and Instrumentation :**

Error analysis; measurement of current voltage, power, energy, power-factor, resistance, inductance, capacitance and frequency; bridge measurements. Electronic measuring instruments: multimeter, CRO, digital voltmeter, frequency counter, Q-meter, spectrum-analyser, distortionmeter. Transducers: thermocouple, thermistor, LVDT, strain-gauges, piezo-electric crystal. Use of transducers in measurements of non-electrical quantities. Data-acquisition systems.

### **Energy Conversion :**

Single-phase transformer : equivalent circuit, phasor-diagram, tests, regulation and efficiency; three-phase transformer; auto transformer. Principles of energy conversion-d.c. generators and motors : performance characteristics, starting and speed control, armature reaction and commutation; three-phase induction motor: performance characteristics, starting and speed

control. Single-phase induction motor. Synchronous generators : performance characteristics, regulation, parallel operation. Synchronous

motors : starting characteristics, applications; synchronous condenser. FHP motors, permanent magnet and stepper motors, brushless d.c. motors, single-phase motors.

### **Power Systems :**

Electric power generation : thermal, hydro, nuclear. Transmission line parameters : steady-state performance of overhead transmission lines and cables. Distribution systems : insulators, bundle conductors, corona and radio interference effects; per-unit quantities; bus admittance and impedance matrices; load flow; voltage control and power factor correction. Economic operation. Principles of overcurrent, differential and distance protection; solid state relays, circuit breakers, concept of system stability. HVDC transmission.

### **Power Electronics and Electric Drives :**

Semiconductor power devices : diode, transistor, thyristor, triac, GTO and MOSFET, static characteristics, principles of operation; triggering circuits; phase controlled rectifiers; bridge converters—fully controlled and half controlled; principles of thyristor chopper and inverter. Basic concept of speed control of dc and ac motor drives.

### **Elements of IC Fabrication Technology :**

Overview of IC Technology. Unit steps used in IC fabrication : wafer cleaning, photolithography, wet and dry etching, oxidation, diffusion, ion-implantation, CVD and LPCVD techniques for deposition of polysilicon, silicon, silicon-nitride and silicon dioxide; metallisation and passivation.