**SYllABUS FOR TEST ( POST :ASSISTANT ENGINEER -ELECTRICAL)transco**

1. Electrical Circuits: KVl, KCl, node and mesh analysis, star/delta transformation, electromagnetic induction, mutual induction, ac fundamentals, transient response of dc and ac networks, sinusoidal steady state analysis, resonance, ideal current and voltage sources, Network theorems, two-port networks, three phase circuits, power measurement in 3-phase circuits.

2. Electrical Measurements: Bridges and potentio meters, PMMC, moving coil, moving iron, dynamometer, induction type measuring instruments, measurement of voltage, current, power, energy, power factor, digital volt meters, multi-meters, ,phase, frequency measurements, Q- meters, oscilloscopes

3. Control Sytems:Principles of feedback control systems, transfer function, block diagram reduction,signal flow graph, Mason's,gain formula,time response, steady state error,Routh , Nyquist criterion, Bode plot, root locus, compensation design

4. Analog and digital electronics: Chacteristics of p-n diode, Zener diode, BJT, FET, amplifiers, biasing, low frequency and high frequency equivalent circuits, frequency response, feedback amplifiers, oscillators, combinational and sequential logic circuits, multiplexer, Schmitt trigger, A/D, D/A converters, basics of 8-bit, 16 bit microprocessors, architecture, programming, interfacing

S. Electrical Machines: Single phase transformer, equivalent circuit, phasor diagram,tests, regulation, efficiency,3-phase transformers, connections, parallel operation,auto transformer, DC machines: types, armature windings,characterstics of dc generators and motors, armature reaction, commutation,starting and speed control of dc motors 3-phase induction motors: principle of operation, types, characteristics, computation of performance, equivalent circuit, starting and speed control Single phase induction motors: types, methods of starting, characteristics Synchronous Machines:emf equation, armature reaction, equivalent circuit, regulation, parallel operation, load sharing, operation with infinite busbars, synchronous motor, synchronous condensor, V and Inverted V curves

6. Power Systems: Basic power generation concepts, transmission line models and performace, Under ground cables, string insulators, corona, distribution systems, per unit quantities, bus impedance and admittance matrices, load flow studies, voltage control, power factor correction, economic operation, symmetrical components, fault analysis, principles of over current, differential, and distance protection, protection of alternators, protection of transformers, proection of transmission lines, protection from lightning, neutral grounding, circuit breakers, types and operation of CBs, system stability concept, swing curves, equal area criterion

7. Utilization: Electric heating, resistance heating, induction heating, dielectric heating, Electric traction, lighting calculations, types of lamps and their working

8. Power Electronics and Drives: SCR, IGBT, MOSFET, static and dynamic characteristics, triggering circuits, phase control rectifiers, bridge rectifiers, principles of de-de converters, Inverters, basic principles and characteristics of adjustable speed dc and ac drives Instruction to Candidates

• The question paper consists of 100 multiple choice questions

• The answer are to be marked on separate

OMR answer sheet using blue or back ball point pen.The answer can not be erased once it is marked. Use of white correction fluid is strictly prohibited. • The duration of the test is 2hrs (120 minutes)

**Syllabus for Electrical Branch Section-A (80Marks): genco**

1.Electrical Circuits and Networks: Kirchhoff’s laws, mesh and node analysis, network theorems, sinusoidal steady state analysis of single phase and three phase circuits, resonance, transient response of RL,RC,RLC circuits for different inputs, two-port networks, Two element network synthesis.

2.Control Systems: Modelling of physical systems, Block diagrams and signal flow graphs, Time andfrequency domain analysis, Steady state errors, Routh’s criterion, Nyquist and Bode plots,compensation, root loci, elementary ideas of state variable analysis, control systemscomponents.

3.Measurements and Instrumentation: SI units, measurement of current, voltage, power, power-factor and energy.Measurement of resistance, inductance capacitance and frequency-bridge methods,transducers and their applications to the measurement of non-electrical quantities liketemperature, pressure, strain, displacement etc., cathode ray oscilloscope, Instrument Transformers.

4.Analog and Digital Electronics: Characteristics of diodes, BJT, FET,SCR, Amplifier biasing, equivalent circuits,frequency response, feedback amplifiers, power amplifiers, oscillators, operationalamplifiers and applications, wave shaping circuits, multi-vibrators, flipflops, universal gatecombinational circuits, A/D and D/A converters.

5.Electrical Machines: Single phase transformer, equivalent circuit, tests, regulation and efficiency, three phase transformer connections parallel operation, auto transformer, principle of energy conversion, winding of rotating machines, DC generators and motors, characteristics, starting and speed control, three phase induction motors performance characteristics, starting and speed control, single phase induction motors, synchronous generators, performance, regulation, parallel operation, synchronous motors, starting characteristics and applications, synchronous condensers, fractional horse power motors, permanent magnet and stepper motors 2

6. Power Electronics and Drives: Characteristics of Power Electronic devices, phase control,bridge converters, choppers and inverters, basic concepts of adjustable speed drives, Control of Induction & Synchronous Motors.

7.Power Systems: Electrical power generation thermal, hydro, nuclear: transmission line parameters;steady state performance of overhead transmission lines and cables, surge propagation,distribution systems, insulators, bundle conductors, corona, and radio interference effects;per-unit quantities: bus admittance and impedance matrices: load flow: voltage control andpower factor correction; economic operation, symmetrical components, analysis ofsymmetrical and unsymmetrical faults.

8. Switchgear protection: Principles of over current, differential and distance protections, circuit breaker, concept of system stability, swing curves and equal area criterion. Power System Operation & Control, Relays, Protection for Generator, Transformers, feeder and Busbars, Grounding, Protection against Over Voltages, Batteries and Battery Chargers.

9. Power Plant Engineering: Basic of Prime movers, Pumps, Boilers & Turbines, Rankine Cycle, Basics of SM & FM, Introduction to Quality management and Environmental Protection.Steam Power Plant, Combustion Process, Gas Turbine Plant, Direct Energy Conservation, Hydro Electric Power Plant & Power from Non-conventional sources, Power plant economicsCapital cost, Investment of fixed charges, operating cost, arrangements for power distribution, load curves, connected load, maximum demand, demand factor, average load, load factor, diversity factor, Environmental considerations- Effluents from Power Plants and impact of environment, Pollution and pollution standards-Methods of pollution control.

**SYLLABUS FOR TEST ( POST :ASSISTANT ENGINEER -ELECTRICAL)SPDCL**

1. Electrical Circuits: KVL, KCL, node and mesh analysis, star/delta transformation, electromagnetic induction, mutual induction, ac fundamentals, transient response of dc and ac networks, sinusoidal steady state analysis, resonance, ideal current and voltage sources, Network theorems, two-port networks, three phase circuits, power measurement in 3-phase circuits.

2. Electrical Measurements: Bridges and potentio meters, PMMC, moving coil, moving iron, dynamometer, induction type measuring instruments, measurement of voltage, current, power, energy, power factor, digital volt meters, multi-meters, ,phase, frequency measurements, Qmeters, oscilloscopes

3. Control Sytems:Principles of feedback control systems, transfer function, block diagram reduction,signal flow graph, Mason's,gain formula,time response, steady state error ,Routh , Nyquist criterion,Bode plot, root locus, compensation design

4. Analog and digital electronics: Chacteristics of p-n diode, Zener diode, BJT, FET, amplifiers, biasing, low frequency and high frequency equivalent circuits, frequency response, feedback amplifiers, oscillators, combinational and sequential logic circuits, multiplexer, Schmitt trigger, A/D, D/A converters, basics of 8-bit, 16 bit microprocessors, architecture, programming, interfacing

S. Electrical Machines: Single phase transformer, equivalent circuit, phasor diagram,tests, regulation, efficiency,3-phase transformers, connections, parallel operation,auto transformer, DC machines: types, armature windings,characterstics of dc generators and motors, armature reaction, commutation,starting and speed control of dc motors 3-phase induction motors: principle of operation, types, characteristics, computation of performance, equivalent circuit, starting and speed control Single phase induction motors: types, methods of starting, characteristics Synchronous Machines:emf equation, armature reaction, equivalent circuit, regulation, parallel operation, load sharing, operation with infinite busbars, synchronous motor, synchronous condensor, V and Inverted V curves

6. Power Systems: Basic power generation concepts, transmission line models and performace, Under ground cables, string insulators, corona, distribution systems, per unit quantities, bus impedance and admittance matrices, load flow studies, voltage control, power factor correction, economic operation, symmetrical components, fault analysis, principles of over current, differential, and distance protection, protection of alternators, protection of transformers, proection of transmission lines, protection from lightning, neutral grounding, circuit breakers, types and operation of CBs, system stability concept, swing curves, equal area criterion

7. Utilization: Electric heating, resistance heating, induction heating, dielectric heating, Electric traction, lighting calculations, types of lamps and their working

8. Power Electronics and Drives: SCR, IGBT, MOSFET, static and dynamic characteristics, triggering circuits, phase control rectifiers, bridge rectifiers, principles of dc-dc converters, Inverters, basic principles and characteristics of adjustable speed dc and ac drives

**Annexure – II Syllabus – Assistant Engineers (Elecl.,) Part-A (80 Questions) NPDCL**

1.Electrical Circuits and Networks: Kirchhoffs laws, mesh and node analysis, network theorems, sinusoidal steady state analysis of single phase and three phase circuits, resonance, transient response of RL, RC, RLC Circuits for different input, two-port networks, Two element network synthesis. Measurement of power by two-wattmeter method; Fourier, Laplace and Z transforms

2. Control Systems: Modeling of physical system, Block diagrams and signal flow graphs, Time and frequency domain analysis, Steady state errors, Routh’s criterion, Nyquist and Bode plots, compensation, root loci, elementary ideas of state variable analysis, control system components.

3. Measurements and Instrumentation: Measurement of current, voltage, power, power-factor and energy, Measurement of resistance, inductance, capacitance and frequency-bridge methods, transducers and their applications to the measurement of non-electrical quantities like temperature, pressure, strain, displacement etc., CRO.

4. Electrical Machines: Single phase transformer; equivalent circuit, tests, regulation and efficiency, three phase transformers connections, parallel operation, auto transformer, principle of energy, Conversion, windings of rotating machines, DC generator and motors, characteristics, starting and speed control, three phase induction motors performance characteristics, starting and speed control, single phase and three-phase induction motors, synchronous generators, performance, regulation, parallel operation, synchronous motors, starting characteristics and applications synchronous condensers, fractional horse power motors, permanent magnet and stepper motors

5. Power Systems: Electrical power generation thermal, hydro, nuclear, Types of Tariffs; transmission line parameters, steady state performance of overhead transmission lines and cables, surge propagation, distribution systems, insulators, bundle conductors, corana and radio interference effects, Sag and Tension, per-unit quantities, bus admittance and impedance matrices, load flow: voltage control and power factor correction, economic operation, Load Frequency Control, symmetrical components, analysis of symmetrical and unsymmetrical faults, principles of over-current, differential and distance protection, circuit breakers, concept of system stability, swing curves and equal area criterion, HVDC transmission Contd..2 : 2 :

6. Analog and Digital Electronics: Characteristics of diodes, BJT, FET, SCR, Amplifier biasing, equivalent circuit, frequency response, feed-back amplifiers, power amplifiers, oscillators, operational amplifiers and applications, wave shaping circuits, multiplexer, filp-flops, universal gates, combinational circuits, A/D and D/A converters, 8-bit microprocessor basics (8085), architecture, programming and interfacing.

7. Power Electronics & Drives: Semiconductor power diodes, transistors, thyristors, triacs, GTOs, MOSFETs and IGBTs - static characteristics and principles of operation; triggering circuits; phase control rectifiers; bridge converters - fully controlled and half controlled; dual converters, principles of choppers, inverters, cyclo-converters and ac voltage controllers. Four quadrant operation, Types of loads, Steady-state stability, Types of braking in dc & ac motors, Energy loss during starting and braking of dc and ac motors, Basic concepts of converter and chopper fed dc drives; V/f control of ac motors, chopper controlled rotor resistance and slip power recovery scheme.

8. Utilization: High frequency eddy current heating, dielectric heating, Arc furnace, electric arc welding & electric resistance welding, Illumination: Laws of illumination, MSCP, SV & MV lamps, Factory, street & flood lighting, Electric traction and track electrification, Speed-time curves, Tractive effort, Specific energy consumption, Mechanism of train movement, adhesive weight and coefficient of adhesion.

9. Switchgear protection: Principles of over current, differential and distance protections, circuit breaker, concept of system stability, swing curves and equal area criterion. Power System Operation & Control, Relays, Protection for Generator, Transformers, feeder and Busbars, Grounding, Protection against Over Voltages, Batteries and Battery Chargers.