SYLLABUS - SHIFT ENGINEER

1. **Basic Electrical Engineering & Electrical Measurements:** Concept of currents, voltage, resistance power & energy, their units, ohm's law, electrical symbols, circuit laws and theorems.
2. **Electro-Magnetic induction:** Self and mutual inductance
3. **A.C fundamentals**: Instantaneous peak, R.M.S and average value of alternating wave, simple Series and Parallel A.C circuits consisting of Resistance, inductance & Capacitance. Analog & Digital ammeters and voltmeters, Wattmeter, Multi-meters, Megger, Low Voltage transformers CT & PT.
4. **Measurement & Measuring Instruments:** Moving coil and moving iron ammeters and voltmeters. Extension of range, Watt-meters, Multimeters, Megger, Basic Electronics
5. **Electrical Machines:** Basic principles of D.C. Motors and generators, their characteristics, speed control & Starting of DC Motors, losses & efficiency of D.C Machines.
6. **1-Phase & 3 Phase Transformers:** Principles of operation, equivalent circuit, voltage regulation O.C. and S.C tests, efficiency, auto transformers, parallel operation of transformers.
7. **Synchronous Machines:** Generation of three phase emf, Armature reaction, Voltage regulation, Parallel operation of two alternators, synchronizing, starting and applications of synchronous motors.
8. **3 Phase Induction Motor:** Rotating magnetic field, principle of operation, equivalent circuit, torque speed characteristic, starting & speed control of 3 phase induction motors, Fractional KW motors, 1-phase induction motors ac, series motor, reluctance motors.
9. **General, Transmission & Distribution:** Different types of power stations, load factor, diversity factor, demand factor, simple problems thereon, cost of generation, inter connection of power stations, power factor improvement, various types of tariffs, types of faults, short circuit current for symmetrical faults.
10. **Battery:** Automotive battery- construction and operation, battery capacity & ratings. Battery tests Charging System- Uses, Construction & operation of charging system. Schematic &working of alternator, starting system, lighting system.
11. **Switchgears:** Rating of Circuit breakers Principles of extinction by oil and air, HRC fuses, protection earthier leakage, over current Buchholz relay, Merzprice system of protection of generators & transformers, protection of feeders and bus bars.
12. **Lightning Arrestors in various transmission & distribution systems**: Comparison of conductor material efficiency of different systems, Electroplating, Electric Drives & Motors
13. **Estimation and costing:** Estimation of lighting scheme, electric installation of machine and relevant IE rules. Details of illumination system, details of load distribution, Design of electrical installation & its symbols (internal & external), Energy efficient equipment, energy audit, protection systems of Electrical circuit,

Earthling Systems, Testing of Electrical Installations, types of cables –Overhead & underground.

14. **Basic Electronics:** Atomic structure of elements, the electron Energy of an electron valence electrons- Free electrons- Voltage source- Constant voltage source- Constant current source.
15. **Electron Emission:** Electron emission, types of electron emission-Thermion emission- Thermionic emitter.
16. **Transistors:** Transistor action-Transistor symbols-Transistor as an amplifier.
17. **Regulated D.C. Power Supply:** Ordinary DC Power supply, Regulated power supply. Types of voltage regulators- Zener diode voltage regulator.
18. **Solid State Switching Circuits:** Switching Circuit-Mechanical Switch Electronic Switch, Advantages of Electronic Switches-Switching action of a transistor.
19. **Working Principle, Advantage & Application of field effect transistors.**
20. **Working Principle, Advantage & Application of Silicon Controlled Rectifier (SCR).**
21. **Working Principle, Advantages & Applications of Triac.**
22. **Working Principle. Advantages & Application of Unijunction Transistor (UJT).**
23. **Renewable Energy:** Solar Energy – Direct Uses, concept, working principle and application of solar thermal systems, Power Generation (On grid & Off Grid System) with simple numerical, Solar Photovoltaic System (SPV) Applications- Solar Lantern, Solar Home System, SPV Street Light, SPV Pumping systems.