

## **KSEB Sub-Engineer Course Outline**

**(In addition to SSC / RRB Course)**

### **Module I**

**Electric circuits:** Network graph. KCL , KVL, node and mesh analysis , transient response of dc and ac networks; sinusoidal steady state analysis, resonance, basic filter concept; ideal current and voltage sources, Thevenin's, Norton's, superposition and Maximum Power transfer theorems, two port network, three phase circuits

### **Module II**

**Electrical Machines:** Single phase transformer – equivalent circuit and phasor diagram, tests, regulation and efficiency; three phase transformers - connections, parallel operation; auto-transformer; energy conversion principles; DC machines - types, windings, generator characteristics, armature reaction and commutation, starting and speed control of motors; 3 phase induction motors - principles, types, performance characteristics, starting and speed control: single phase induction motors; synchronous machines - performance, regulation and parallel operation of generators, motor starting, characteristics and applications; servo and stepper motors.

### **Module III**

**Power Systems:** Basic power generation concepts; transmission line models and performance; cable performance, insulation; corona and radio interference; distribution systems; per-unit quantities; bus impedance and admittance matrices; load flow; voltage control; power factor correction; economic operation; symmetrical components; fault analysis; principles of over-current, differential and distance protection; solid state relays and digital protection; circuit breakers; system stability concepts, swing curves and equal area criterion; HDVC transmission

### **Module IV**

**Electrical and Electronic Measurements:** Bridges and potentiometers; PMMC, moving iron, dynamometer and induction type instruments; measurement of voltage, current, power, energy and power factor; instrument transformers; digital voltmeters and Multimeters; phase, time and frequency measurement; Q-meters; oscilloscopes; potentiometric recorders; error analysis.

**Instrumentation:** Insulation Megger, Earth Megger, Kelvin's Double Bridge, Quadrant electrometer, Rotating sub-standard, TOD meter.

**Module V**

**Power Electronics and 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; principles of choppers and inverters; basic concepts of adjustable speed dc and ac drives

**Basic Electronics, Electronic Devices and Circuits & Digital Electronics:**

Transistor Amplifiers

Digital electronics and Op-Amps

Semiconductor materials, devices and circuits

**Module –VI****[KSEB Sub-Engineer Specific Topics]****Basics:**

Faraday's Laws of Electrolysis, Electroplating, primary and secondary cells, comparison of lead acid and alkaline cells, Initial charging and commissioning of new batteries, Charging methods, Ampere hour, and Watt hour efficiencies, Galvanizing and Anodizing, Extraction of zinc and aluminium, field application of Electrolysis.

**Renewable Sources of Energy:**

Conventional sources of energy- non conventional source of energy

Description of photovoltaic effect- Electro characteristics- Application of solar energy devices.

Wind energy basics- classifications- wind energy turbines- conversion of wind energy to electrical energy brief idea. Application of wind energy devices.

Concepts of ocean energy- concepts of wave energy- methods hybrid cycles- physical principles fixed devices and floating devices

**Electrical Drives in Industry:**

Mechanical features of electric motor- frame size- relation between speed and frame size- types of enclosures.

Electric drives- classification of electric drives- group, individual and multimotor drives matching the drive with load- basic classes of duty- continuous- short time- intermittent periods duty, selection of electric drives- steel mills, paper mills, cement mills.

Electric traction- system of electric traction- direct electric traction- diesel electric traction merits and demerits- factors affecting specific energy consumption.

Traction motors- DC and AC motors- properties and characteristics- control of DC motors series parallel control systems of electric traction- DC single and three phase systems of supply brief description.

## **Utilization of Electrical Power**

### **Electrical Heating**

Electric heating and welding- advantages and types of electric heating- properties of resistance heating materials- design of heating elements- Resistance ovens- methods of temperature controls.

Induction heating- Principle- factors affecting induction heating- induction furnace- core type and core less type- high frequency eddy current heating- dielectric heating- equivalent circuit loss angle application of dielectric heating- Arc furnace- direct and indirect types.

Electric welding- types- resistance welding- spot welding- pre welding- seam welding- electric arc welding- electrical properties of negative resistance- types of arc welding- requirements of welding generators and transformers- use of reactor for control of welding current- third brush and bipolar welding generators- description.

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## **Usual footnote in Kerala PSC exam syllabus/ notification**

*NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper.*