

Name of Specialization: Power System

No. of Question: 50 (Objective Type)

Duration: 1 Hr. 30 Min

Maximum Marks:50

Fault Analysis: Positive, Negative and Zero sequence equivalent circuits of lines, two and three winding transformers and synchronous machines. Analysis of shunt and series faults, effect of neutral grounding

Phase Controlled Converters: Performance measures of single and three-phase converters with discontinuous load current for R, RL and RLE loads. Effect of source inductance for single and three-phase converters

Transient Stability: Equal area criterion and its application to transient stability studies under common disturbances including short circuits. Critical clearing angle and critical clearing time. Numerical solution of swing equation by step-by-step method.

World energy situation. Indian energy scene. Comparative study of thermal, hydro, nuclear and gas power plants. Selection and location of power plants. Impact of thermal, gas, hydro and nuclear power stations on environment, air and water pollution, greenhouse effect (global warming), impact on land. Renewable and non-renewable energy sources. Conservation of natural resources and sustainable energy sources.

Interconnected System: Merits and demerits, parallel operation of alternators, synchronizing current, power & torque, effect of change of excitation, driving torque & speed of one of the alternators, load sharing and power limit of interconnected stations, voltage, frequency & load control of interconnected stations.

Characteristics of Electric Motors: Characteristics of DC motors, 3-Phase induction motors and synchronous motors, Starting and braking of electric motors. Dynamics of Electric Drives: Mechanical system, Fundamental torque equations, components of load torque's, Dynamic conditions of a drive system, Energy loss in transient operations, Steady State Stability, Load equalization

Static Relays: Introduction, merits and demerits of static relays. Comparators: amplitude and phase comparator, duality between amplitude and phase comparators. Circulating current type phase-splitting type and sampling type amplitude comparators. Vector product type and coincidence type phase Comparators. (ii) CTs & PTs: Current transformer (CT) Construction, measurement CT and protective CT. Type of potential transformers. Steady state ratio and phase angle errors in CTs and PTs. Transient errors in CT and CVT. Bulk power transmission over long distance, Need for EHV transmission, Problem of EHV transmission power handing capacity and surge impedance loading, Current carrying capacity of conductor, Choice of economic voltage.

Power System Security: Introduction to power system security, System monitoring, contingency analysis, System state classification, security control. Automatic Generation Control: Speed governing characteristic of a generating unit. Load sharing between parallel operating generators. Introduction to automatic generation control of an area by computer

Load Forecasting: Classification and characteristics of loads, Approaches to load forecasting, forecasting methodology, Energy forecasting, Problems of AC transmission systems, power flow in parallel paths and meshed system, factors limiting load capability, stability consideration, Power flow control of an AC transmission line. Basic types of fact controllers. Advantages of FACTS technology.

Voltage Stability: Power system voltage stability concept, comparison of angle and voltage stabilities, Power system loads, generator P-Q and Q-V characteristics. Voltage collapse. Voltage stability analysis. Methods of improving voltage stability.

Artificial Neural Networks: Biological Neuron, Neural Net, Use of neural nets, Applications, Perceptron Model, Idea of single layer and multilayer neural nets, Back Propagation, Hopfield nets, Supervised and unsupervised learning.