

**SYLLABUS FOR PhD ENTRANCE EXAMINATION -2023**

**SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING**

**PART – A**

**Marks 50**

**Power Semiconductor devices:** Power semiconductor devices used for drives control, GTO, BJT, power MOSFET, IGBT, MCT and IGCT structures, Ratings, comparison and their applications.

**Phase controlled converters:** Phase control, single phase semi-converter & fully controlled converter, three phase semi controlled & fully controlled converter, dual converters, power factor improvement methods.

**DC-DC, Converters-**principle of operation of buck, boost, buck-boost, Cuk, flyback, forward, push-pull, half bridge, full bridge & isolated Cuk Converters, condition for DCM.

**Power Systems:** Per-unit quantities, Bus admittance matrix, Gauss Seidel and Newton-Raphson load flow methods, Voltage and Frequency control, Power factor correction, Symmetrical components, Symmetrical and unsymmetrical fault analysis, Principles of over-current, differential and distance protection; Circuit breakers, System stability concepts, Equal area criterion.

**Control Systems:** Mathematical modelling and representation of systems, Feedback principle, transfer function, Block diagrams and Signal flow graphs, Routh-Hurwitz and Nyquist criteria, Bode plots, Root loci, Stability analysis, Lag, Lead and Lead-Lag compensators; P, PI and PID controllers; State space model, State transition matrix.

**REFERENCES:**

1. Rashid M.H, "Power Electronics: Circuits Devices and Application Edition, Pearson, 2011
2. Ned Mohan, Tore M. Undeland, William P. Robbins, "Power Electronics Converters, Applications, and Design", 3rd Edition, Wiley India Pvt. Ltd, 2011
3. Gopal M., "Digital Control and State Variable methods", McGraw Hill, 3rd Edition
4. K. R. Padiyar, "HVDC Power Transmission Systems", New Age International, 3<sup>rd</sup> edition, 2015.
5. K.R Padiyar, "FACTS Controllers in power transmission and distribution", New Age International

## RESEARCH METHODOLOGY

**Research and Types of research:** Meaning of Research- Objectives of Research- Motivation in Research. Research methods *vs* Methodology. Types of research – Descriptive *vs.* Analytical, Applied *vs.* Fundamental, Quantitative *vs.* Qualitative, Conceptual *vs.* Empirical. Research Process. Criteria of good Research.

**Research Formulation** – Defining and formulating the research problem - Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem – Literature review – Primary and secondary sources – reviews, treatise, monographs-patents – web as a source – searching the web - Critical literature review – Identifying gap areas from literature review - Development of working hypothesis.

**Data Collection** and analysis: Execution of the research - Observation and Collection of data - Methods of data collection – Modeling, Mathematical Models for research, Sampling Methods- Data processing and Analysis strategies. Data Analysis with Statistical Packages – Hypothesis-testing, Generalization-and- Interpretation.

**Reference Books:**

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. *An introduction to ResearchMethodology*, RBSA Publishers.
2. Kothari, C.R., 1990. *Research Methodology: Methods and Techniques*. New Age International. 418p.
3. Sinha, S.C. and Dhiman, A.K., 2002. *Research Methodology*, Ess Ess Publications. 2 volumes.

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