School of Electrical Sciences (Electrical Engineering)

Q-Exam subject & Syllabus

Subject Name: Electric Circuits

Syllabus:

Ideal voltage and current sources, dependent sources, R, L, C, M elements;
Network solution methods: KCL, KVL, Node and Mesh analysis;
Network Theorems: Thevenin's, Norton's, Superposition and Maximum Power Transfer theorem;
Transient response of dc networks, two port networks,
Single phase ac circuits; resonance; balanced and unbalanced three phase circuits; complex power and power factor in ac circuits.

Reference Books:

1. E. Hughes, "Electrical Technology," Pearson Education, 2010.
2. V. Del Toro, "Electrical Engg Fundamentals," PHI Learning, 2009.
3. I. J. Nagrath and D. P. Kothari, 'Basic Electrical Engineering' TATA Mc Graw Hill Education, 2009.
4. D. A. Bell, "Electric Circuits," 7th Ed., Oxford Higher Education, 2009

Subject Name: Signals and Systems

Syllabus:

LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeroes, frequency response.
Continuous-time signals: Fourier series and Fourier transform, sampling theorem and applications. Discrete-time signals: DTFT, DFT, z-transform, discrete-time processing of continuous-time signals.

Reference Books:

1. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and Systems," 2nd Ed., Pearson Prentice Hall, 2015.
2. S. Haykin and B. V. Veen, "Signals and Systems," 2nd Ed., Wiley India, 2007

Subject Name: Electric Machines

Syllabus:

Single phase transformer: equivalent circuit, phasor diagram, open circuit and short circuit tests, regulation and efficiency;
Three-phase transformers: connections, vector groups, parallel operation; Auto-transformer, Electromechanical energy conversion principles;

DC machines: separately excited, series and shunt, motoring and generating mode of operation and their characteristics, speed control of dc motors;
Three-phase induction machines: principle of operation, types, performance, torque-speed characteristics, no-load and blocked-rotor tests, equivalent circuit, starting and speed control; Operating principle of single-phase induction motors;
Synchronous machines: cylindrical and salient pole machines, performance and characteristics, regulation and parallel operation of generators, starting of synchronous motors; Types of losses and efficiency calculations of electric machines

Reference Books:

1. S. J. Chapman "Electric Machinery Fundamental," 4th Ed., MG Hill International Edition, 2006.
2. A. E. Fitzgerald, C. Kingsley, Jr, and S. D. Umans, "Electric Machinery," 6th Ed., Mc Graw Hill International Edition, 2002.
3. P.S Bimbhra, "Generalized Theory of Electrical Machines," Khana Publisher.

Subject Name: Control Systems

Syllabus:

Mathematical modeling and representation of systems
Feedback principle, transfer function, Block diagrams and Signal flow graphs,
Transient and Steady-state analysis of linear time invariant systems,
Stability analysis using Routh-Hurwitz and Nyquist criteria, Bode plots, Root loci,
Lag, Lead and Lead-Lag compensators, P, PI and PID controllers;
State space model, Solution of state equations of LTI systems

Reference Books:

1. B. C. Kuo & F. Golnaraghi, "Automatic Control Systems", John Wiley, 2003.
2. M. Gopal, "Control Systems: Principles and Designs", 2nd Edition, McGraw Hill, 2002.
3. R. C. Dorf & R. H. Bishop, "Modern Control Systems", Prentice Hall, 2000.

Subject Name: Power Electronics

Syllabus:

Static V-I characteristics and firing/gating circuits for Thyristor, MOSFET, IGBT;
DC to DC conversion: Buck, Boost and Buck-Boost Converters;
Single and three-phase configuration of uncontrolled rectifiers;
Voltage and Current commutated Thyristor based converters;
Bidirectional ac to dc voltage source converters;

Magnitude and Phase of line current harmonics for uncontrolled and thyristor based converters;
Power factor and Distortion Factor of ac to dc converters;
Single-phase and three-phase voltage and current source inverters, sinusoidal pulse width modulation.

Reference Books:

1. Muhammad H. Rashid, "Power Electronics: Circuits, Device and Applications", 2nd Ed. 1993, Prentice-Hall, Inc.
2. Ned Mohan, T M Undeland, W P Robbins, "Power Electronics: Converters, Application and Design", John Wiley, 3rd Edition, 2003
3. Thedore Wildi , "Electrical Machines, Drives and Power System", Prentice Hall International, Inc, 1997

Subject Name: Power Systems

Syllabus:

Basic concepts of electrical power generation, ac and dc transmission concepts,
Models and performance of transmission lines and cables,
Economic Load Dispatch (with and without considering transmission losses), Series and shunt compensation,
Electric field distribution and insulators, Distribution 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, directional and distance protection; Circuit breakers,
System stability concepts, Equal area criterion.

Reference Books:

1. C. L. Wadhwa, Electrical Power Systems, New Age.
2. L. M. Faulkenberry and W. Coffer, Electrical Power Distribution and Transmission, PHI, 1996.
3. W. D. Stevenson, Elements of Power System analysis, McGraw Hill, 1982
4. I. J. Nagrath and D. P. Kothari, Modern Power System Analysis, TMH, 2003.