

Audit Course-6

Power Electronics

Unit I : Power Devices

Construction, Steady state characteristics & Switching characteristics of SCR, Construction, Power MOSFET:N-Channel and P-Channel e.g.CSD17313Q2Q1 and CSD25404Q3, Steady state characteristics Power MOSFET & IGBT, MOSFET and IGBT Gate Drivers and Types,Gallium Nitride (GaN) FET Drivers e.g. UCC27511, SCR ratings: IL, IH, VBO, VBR, dv/dt, di/dt, surge current & rated current. Gate characteristics, Gate drive requirements, Synchronized UJT triggering for SCR, triggering of SCR using IC-785, gate drive circuits for Power MOSFET / IGBT.

Unit II : AC-DC Power Converters

Concept of line & forced commutation, Single phase Semi & Full converters for R, R-L loads, Performance parameters, Effect of freewheeling diode, Three phase Semi & Full converters for R load.

Unit III : DC-AC Converters

Single phase bridge inverter for R and R-L load using MOSFET / IGBT, performance parameters, single phase PWM inverters. Three phase voltage source inverter for balanced star R load.

Unit IV : DC-DC converters & AC Voltage Controller

Working principle of step down chopper for R-L load (highly inductive), control strategies. Performance parameters, Step up chopper, 2-quadrant & 4-quadrant choppers, SMPS. Buck regulator e.g. TPS54160, hysteretic buck regulator e.g. LM3475, Switching Regulator and characteristics of standard regulator ICs – TPS40200, TPS40210, Low Drop out (LDO) Regulators ICs-TPS 7A4901, TPS7A8300; Single phase full wave AC voltage controller with R load.

Unit V :Power Electronics Applications

ON-line and OFF line UPS with battery AH, back up time, battery charger rating. Electronic ballast: Characteristics of fluorescent lamps and advantages over conventional ballast. Single phase separately excited DC motor drive, stepper motor drive, BLDC motors. Variable voltage & variable frequency three phase induction motor drive.

Unit VI: Resonant Converters & Protection of Power Devices & Circuits

Need for resonant converters, SLR half bridge DC/DC converter in low frequency, Concept of zero current switching (ZCS) and zero voltage switching (ZVS) resonant converters. Cooling & heat sinks, over voltage conditions, over voltage protection circuits, over current fault conditions, over current protection. Electromagnetic interference: Sources, minimizing techniques.

Text Books: 1. M. H. Rashid, "Power Electronics circuits devices and applications", PHI 3rd edition, 2004 edition, New Delhi. 2. M. S. Jamil Asghar, "POWER ELECTRONICS", PHI, 2004, New Delhi

Reference Books: 1. Ned Mohan, T. Undeland & W. Robbins, "Power Electronics Converters applications and design" 2nd edition, John Willey & sons, Singapore 2. U. R. Moorthi, "POWER ELECTRONICS, DEVICES, CIRCUITS & INDUSTRIAL APPLICATIONS" , Oxford University Press, New Delhi, 2005 3. P.C. Sen, "Modern Power Electronics", S Chand & Co New Delhi. 4. "GE SCR MANUAL" 6th edition, General Electric, New York, USA 5. Dr. P. S. Bimbhra, "Power Electronics", Khanna Publishers, Delhi. 6. Nagrath Kothari, "Electrical Machines", TMH.