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Reg. No.....

Name.....

M.TECH DEGREE EXAMINATION**First Semester****Model Question Paper - I****Branch: Electrical and Electronics Engineering****Specialization: Power Electronics****MEEPE 103 POWER CONVERTERS**

(2013 Admission onwards)

Time: Three hours

Maximum: 100 Marks

1. (a) A dc voltage of 100 V is switched on to a 23Ω resistance in series with 2 mF capacitance. Find the magnitude of current and capacitor voltage at $t = 0.2$ Seconds. [6 Marks]
- (b) A load comprises of resistance and inductance is fed from voltage source of $v = V_m \sin(\omega t)$ through a diode. A freewheeling diode is connected across the load. Analyze the circuit assuming the output current is continuous and sketch the output current and output voltage waveforms. [12 Marks]
- (c) An ideal capacitor of value C is connected to $V_m \sin(314t)$ through one SCR. If SCR is fired at firing angle α in the positive half cycle of input supply voltage, Will the SCR conduct in the positive half cycle when fired at the same firing angle? Explain. [7 Marks]

OR

2. (a) Explain in detail various thyristor specifications. [15 Marks]
 - (b) Illustrates the limitations on di/dt and dv/dt of thyristors. [10 Marks]
3. (a) A single phase semiconverter is feeding a resistive load. Derive an expression for average load voltage. [7 Marks]
 - (b) A three phase full converter is fires at 75 degrees. Sketch phase voltages, line voltages, scheme of firing pulses and clearly indicate the output voltage. [18 Marks]

OR

4. (a) A single phase full converter supplied from $V_m \sin(\omega t)$ feeds RL load. A freewheeling diode is connected across the load. Sketch voltage across and current through freewheeling diode. [7 Marks]
- (b) A three phase semi converter is fired at 30 degrees. Sketch firing pulses, line and phase voltages and output voltage. [18 Marks]
5. With neat circuit diagram explain the operation of a buck boost converter in continuous and discontinuous current modes.

OR

6. (a) Find the duty ratio of a cuk converter operating at 2 kHz to obtain an output voltage 200V. The input dc voltage consist of two series connected 12V batteries. Also find the voltage across the switch. [8 Marks]
- (b) In a step up converter, the duty ratio is adjusted to regulate the output voltage V_o at 48 V. The input voltage varies in a wide range from 12 to 36V. The maximum power output is 120W. For stability reasons, it is required that the converter operate in a discontinuous – current- conduction mode. The switching frequency is 50 kHz. [8 Marks]
- (c) In a buck-boost converter operating at 20 kHz, $L=0.05\text{mH}$. The output capacitor C is sufficiently large and $V_d = 15 \text{ V}$. The input is to be regulated at 10V and converter is supplying a load of 10W. Calculate the duty ratio D . [9 Marks]
7. (a) With neat circuits and V-I diagrams, classify dc chopper circuits. [10 Marks]
- (b) A type-A chopper is feeding a separately excited dc motor drive. If motor current is discontinuous, derive an expression for the time at which motor current falls to zero during OFF- period of chopper. [15 Marks]

OR

8. (a) Briefly discuss various voltage control schemes in voltage source inverters. [7 Marks]
- (b) A three phase voltage source inverter is feeing balanced star connected resistive load and operates in 180 degree mode of operation. Sketch firing signals and phase and line voltages. Provide derivations. [18 Marks]