BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: M.TECH **SEMESTER : I**
BRANCH: EEE **SESSION : MO/18**

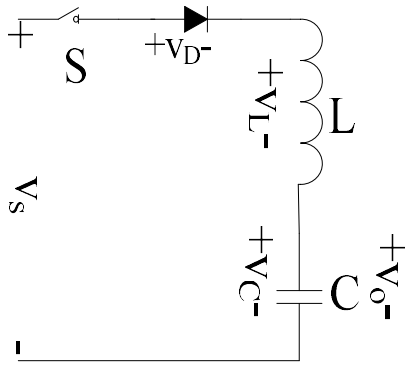
SUBJECT: EE507 ADVANCED POWER ELECTRONICS

TIME: 3 HOURS **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) Draw vertical cross sectional diagram of POWER MOSFET. Label its different layers. Explain and Draw switching characteristics of Power MOSFET. [5]

Q.1(b) In the diode and LC network, the capacitor is charged to voltage Vo with upper plate positive. Switch S is closed at t=0. Derive expressions for current through and voltage across C. [5]



Q.2(a) With the help of equivalent circuit diagram explain operating principle of Fly Back converter along with the theoretical waveforms under discontinuous mode of operation. [5]

Q.2(b) The average output voltage of forward converter is 24V at a resistive load of 0.8Ω. The ON-state voltage drops of transistors and diodes are 1.2 V and 0.7V, respectively. The duty cycle is 0.4 and switching frequency is 1kHz. The DC supply voltage is 12V. The turns ratio of transformer is a=Ns/Np=0.25. Determine (a) Input current (b) Input power (c) Open circuit transistor voltage. [5]

Q.3(a) Explain Space vector PWM switching scheme. Obtain and draw the instantaneous phase voltages (time averaging) during one switching cycle period for sector 1. [5]

Q.3(b) Explain the operating principle of Flying capacitor Multilevel converter with a neat circuit diagram. [5]

Q.4(a) A basic series resonant inverter has both inductors (L_1=L_2=L) of 50μH. It has a capacitor of 6μF. Connected resistive load is of 2Ω. The DC supply voltage is 220V and the frequency of output voltage is 7kHz. Determine (a) the maximum possible turn OFF time for the Thyristor (b) maximum permissible frequency. [5]

Q.4(b) The L-type ZCS Resonant converter delivers a maximum power of 400mW at output voltage of 4V. the supply voltage is 12V. The maximum operating frequency is 50kHz.Determine the values of L and C. Assume that the intervals t1 and t3 are small, and x=(peak inductor current/output current)=1.5. [5]

Q.5(a) Write short notes on IGBT gate Drive circuit. [5]

Q.5(b) Explain the PIN configuration of UC3843 chip. Draw the functional block diagram of UC3843 chip? [5]

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