Registration no:

2ndSem M TechRegular/ BackExamination – 2015-16
POWER CONVERTER-II
PED/POWER ELECTRONICS/
POWER ELECTRONICS AND POWER SYSTEM
**Time: 3 Hours**
Max marks: 70
Q.CODE:W759
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1   Answer the following questions: (2 x 10)
   a)   What is the difference between unipolar and bipolar switching in PWM?
   b)   A filter at the input stage is required in a buck converter where as in boost converter a input filter may not be required, why?
   c)   How the current and source inverters are different?
   d)   In SVM why two consecutive voltage vectors are selected for synthesizing the reference voltage vectors?
   e)   Draw the circuit diagram of two-transistor flyback converter.
   f)   What will happen in forward converter if we select tertiary turns equal to primary turns and duty ratio greater than 0.5?
   g)   What is total harmonic distortion and how it is related to distortion factor?
   h)   Draw the characteristics showing the effect of parasitic elements on the voltage conversion ratio in a buck-boost converter.
   i)   What is the difference between PWM and SVM?
   j)   Draw the basic circuit of L-type and M-type resonant converter switch.

Q2 a) What is switch mode rectifier? Describe the operation of a single phase switch mode rectifier. What will happen if the inductor is moved from load side to source side?   (5)
   b) Explain the operation of series inverter with diagram and waveforms. What are disadvantages and how they are overcome?   (5)

Q3 a) Describe the operation of 5-level flying capacitors multilevel inverter with diagrams and the switching states in a table.   (6)
   b) What is reactive power compensation using multilevel inverter? Explain using phasor diagrams.   (4)

Q4   For three phase SVM Based inverter, derive the expressions of durations for which the consecutive voltage vectors are to be applied in order to synthesize V_{ref}, in case the reference vector is lying in sector one. What do you mean by pulse of appropriate polarity?   (7+3)

Q5 a) Derive the expression for output voltage of Boost converter by considering a non-ideal inductor that is the inductor has a finite resistance 'r'.   (5)

b) In a step down converter, consider all components to be ideal. V_0 is held constant at 5V by controlling the switch duty ratio D. calculate the minimum inductance L required to keep the converter operation in continuous conduction mode under all conditions if V_d(input) is 10-40V, P_0 greater than equal to 5W and f_s=50kHz. **(5)**

Q6 a) Explain the working of an L-type zero current switch resonant converter with circuits and waveforms. **(5)**

b) **(5)**
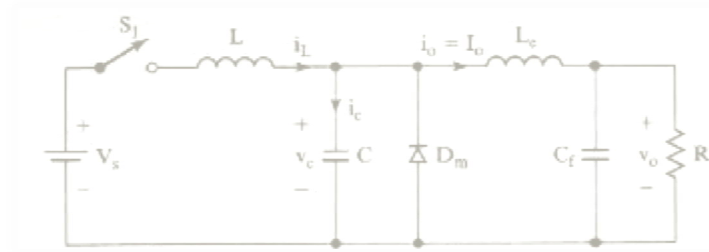
The ZCS resonant converter shown above delivers a maximum power of P_L=400mW at V_0= 4V. The supply voltage is V_s=12V. The maximum operating frequency is f_{max}=50kHz. Determine the values of L and C. Assume the mode I and mode III time intervals t_1 and t_3 are negligible and x=1.5, where $x=I_m/I_0$.

Q7 Find the turns ratio of the transformer such that output voltage required is 100V at D=0.5 for nominal input voltage of 12V in the below mentioned circuit. **(10)**
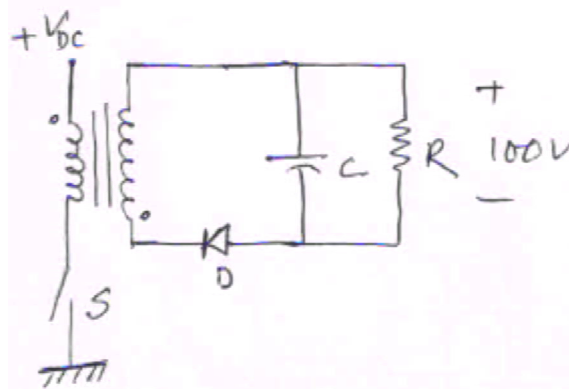
i) Compute the minimum and maximum value of D if input is varied from 10V to 14V, keeping V_0 constant.
ii) Compute the value of L_s on the secondary side so that i_2 is just continuous at minimum value of D.
iii) Find the value of 'C' for output voltage ripple of 1% at D=D_{max}. Take V_D=0.8V, voltage across the switch 'S'=0.8V, f_s=2 kHz.

Q8 Answer any two **(5 x 2)**
a) Forward converter
b) Current regulated PWM voltage source inverter
c) Sepic converter
d) Three Phase Series Inverter.