Reg. No.									

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

II SEMESTER M.TECH (PESC) MAKE UP EXAMINATIONS, JUNE 2016

SUBJECT: ADVANCED POWER ELECTRONIC CONVERTERS [ELE 528]

REVISED CREDIT SYSTEM

Time: 3 Hours 30 JUNE 2016 MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** the questions.
- Missing data may be suitable assumed.

1A. Design a buck converter that has an input voltage of 3.3 V and an output voltage of 1.2 V. The output current varies between 4 A and 6 A. The output voltage ripple must not exceed 2%. Specify the inductor value such that the peak-to-peak variation in inductor current does not exceed 40% of the average value. Assume switching frequency to be 500 kHz. ***05***

1B. Design a boost converter that will have an output of 25 V from a 9 V source. The load resistance is 50 Ω. Assume ideal components and continuous mode of operation. Maintain output voltage ripples less than 1% and current ripples to be 10 % of average inductor current. Take fs = 25 kHz. ***05***

2A. With a neat circuit schematic and relevant waveforms discuss the operating principle of SEPIC. Hence deduce suitable expression for output voltage and comment on selection of inductors and capacitors for continuous mode of operation. Assume ideal components. ***05***

2B. A buck converter has an input of 12 V and is to have an output of -18 V supplying a 40 W load. Select the duty ratio, inductor size such that the change in inductor currents is not more than 10% of the average inductor current, the output ripple voltage is not more than 1%, and the ripple voltage across C_1 is not more than 5%. Take fs = 50 kHz. ***05***

3A. A forward converter has the following parameters: Vs = 100 V, N1/N2 = N1/N3 = 1, Lm=1mH, Lx = 70 µH, R = 20 Ω, C = 33 µF and D=0.35. The switching frequency is 150 kHz. Determine a) output voltage and b) peak current in Lm in the transformer model. ***04***

3B. A flyback converter has the following parameter: Vs = 24 V, N1/N2 = 3, Lm = 500 µH, R = 5 Ω, C = 200 µF, fs = 40 kHz and Vo = 5 V. Determine duty ratio, maximum and minimum current in Lm, output voltage ripple. Now, if the load resistance is increased from 5 Ω to 20 Ω, with all other parameters remaining unchanged, determine the output voltage. ***06***

4A. A parallel resonant DC-DC converter supplying a resistive load of 10 Ω from a source voltage of 100 V. The switching frequency is 20 % excess of the resonant frequency of 100 KHz, and characteristic impedance Zo = 5 Ω. Select suitable values of Lr and Cr for the converter and hence determine the output voltage. ***04***

4B. In a SLR DC-DC converter, Vs = 100 V, Lr = 75 µH, Cr = 0.04 µF, fs = 100 kHz, R_L = 10 Ω. Determine the output voltage V_0. If the source voltage now varies over ±5%, find the range of switching frequency necessary to regulate the output voltage. ***06***

5A. A DC - DC converter with zero voltage switching has Vs = 20 V, Cr = 0.047 µF, Io = 5 A, Zo= 4.6 Ω, the time for which diode Dr is on is 0.37µsec. Determine the switching frequency such that the output voltage is 10 V. ***05***

5B. The Zero Current Switch resonant converter has following parameters, Vs=100 V, Io=1.5 A, Lr=10 µH, Cr=0.01 µF and fs= 50 kHz. Determine the Output voltage of converter. ***05***

6A. Explain the discontinuous-conduction mode operation of SLR DC-DC converter working in ωs<ωo using suitable circuit diagram and waveforms. ***06***

6B. Write a technical note on online UPS and offline UPS systems. ***04***