Reg. No.



VII SEMESTER B. TECH (ELECTICAL & ELECTRONICS ENGINEERING) END SEMESTER EXAMINATIONS, NOVEMBER 2022

MODERN POWER CONVERTER [ELE 4085]

REVISED CREDIT SYSTEM

Tim	Date: 23 NOV 2022	Max. Marks: 50
Insti	 ructions to Candidates: Answer ALL the questions. Missing data may be suitably assumed. 	
1A.	Why ferrite core is suitable for design of inductor in switc supply? Give any four reasons.	hed mode power (02)
1B.	State and prove ampere-second balance and volt-second balance. Also, establish the relationship between input voltage and output voltage for buck type DC-DC converters by applying ampere-second balance to the capacitor. (C	
1C.	Analyze the waveforms of inductor current, inductor volta current of an indirect dc-dc converter with negative polarity o voltage can be either higher or lower than the input vo expression to estimate the output voltage.	ge and capacitor utput. The output Itage. Derive an (04)
2A.	In a step-up DC-DC converter, the duty ratio is adjusted to revoltage at 96V. The input voltage varies in a wide range of maximum power output is 240W. Assume switching freq Determine values of the system components.	gulate the output 24 to 72V. The uency is 50kHz. (03)
2B.	How to reduce the switching stress in switched mode power s with the help of dissipative snubber circuit and switching loci.	supply, explain (03)
2C.	Design a Push pull converter is having a source voltage is 30 is N2/N1 = 0.5. Assume switching frequency of 10kHz, the lo Ω . The duty ratio is considered to be 0.3, filter inductance values are 0.5mH &50µF. Determine the output voltage, the minimum values of inductor current (i _{Lx}) and output voltage is components are ideal.	V and turns ratio ad resistance is 6 and capacitance ie maximum and ripple. Assume all (04)
3A.	Analyze the magnetizing inductor current and source current Fly-back converter operating in discontinuous conduction r expression of output voltage by analyzing the power relations	nt waveform of a node. Derive the nips in the circuit. (04)
3B.	A Forward converter has the following parameters. The sour and turns ratio is N1/N2= 1. The magnetizing inductance is 1 inductance is 80µH, the load resistance is 15 Ω and filter capa	ce voltage is 80V nH. The load side citor is 33µF. The

voltage ripple.**3C.** Explain, why soft switching is more preferred in present switched mode power supply.

duty ratio is 0.35 and switching frequency is 100kHz. Determine (a)the output voltage (b) Peak value of magnetizing (L_m) in the transformer model (c) output

(04)

(02)

- **4A.** Analyze the waveforms of current through inductor L_r and voltage across the capacitor C_r of parallel loaded resonant converter. The voltage across the capacitor and current through the inductor stay at zero for an interval that can be varied in order to control the output voltage.
- **4B.** What are the factors affecting the choice of Zero voltage switching resonant converter in switched mode power supply.
- **4C.** A series loaded resonant dc-dc converter operates in continuous conduction mode The source voltage is 120V. The resonant inductor and capacitors are 60μ H & 0.18 μ F respectively. The load resistance is 10 Ω , switching frequency is 100kHz. Determine the output voltage of the converter. Assume the output filter components L₀ and C₀ produce a ripple free output. Justify the output voltage of the converter. Refer Fig.Q.4C.



5A. The input to the converter is 60V. It is desired to supply a regulated voltage and currents are 20V and 6A. The load is modelled here with a 9 Ω load. An accurate 6V reference is available as shown in Fig.Q.no.5A. Determine dc gain, corner frequency and quality factor. Choose appropriate parameters. Assume switching frequency is 100kHz.



- **5B.** Assuming ideal components and continuous conduction mode, develop the small-signal ac equivalent circuit model of a buck-boost converter. **(03)**
- **5C.** What are the parameters needed for inductor design in SMPS? Design the window factor, area products and number of turns required. **(03)**

(04)

(02)

(04)

(04)