

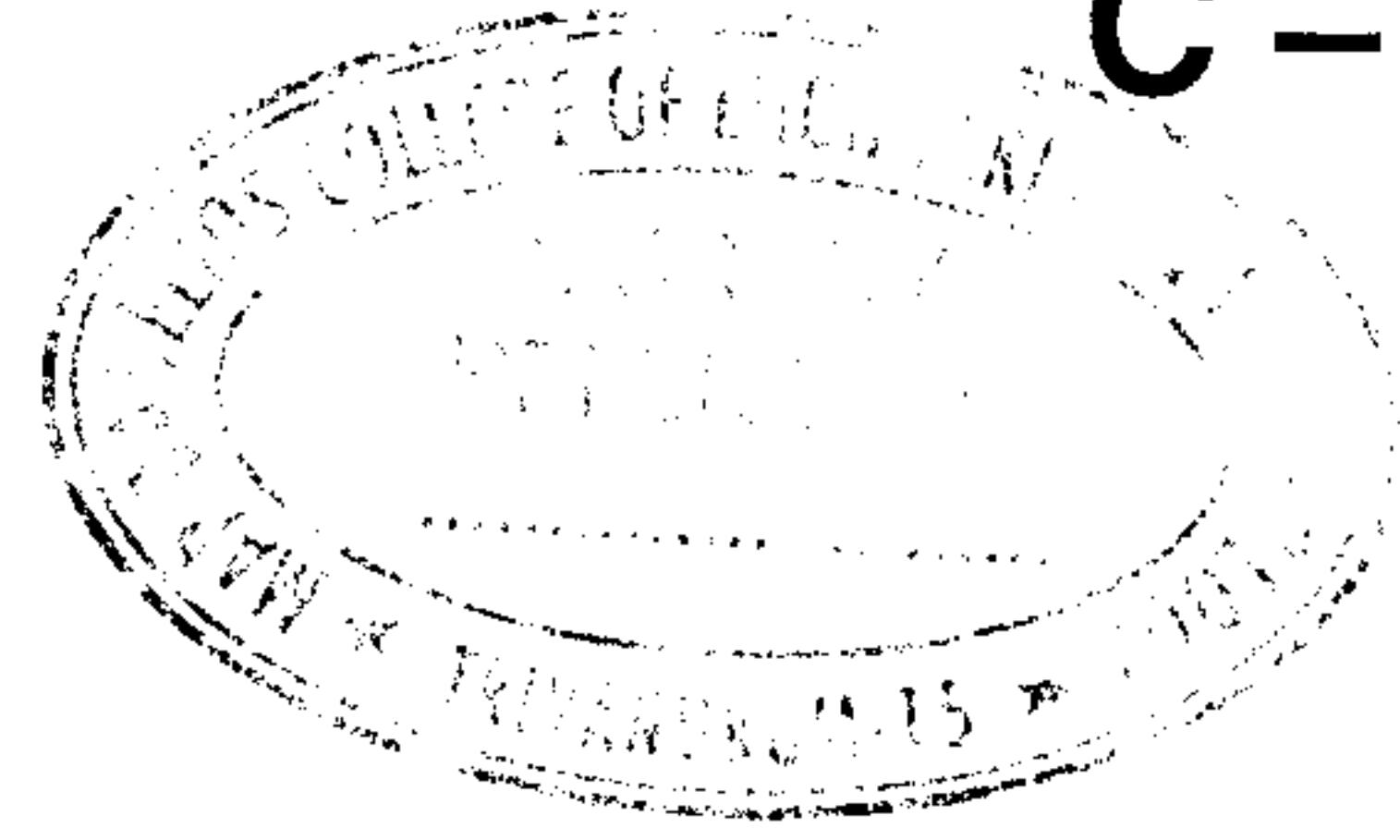


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C – 2764

Reg. No. :

Name :



Sixth Semester B.Tech. Degree Examination, June 2017
Branch : Electrical and Electronics Engineering
(2013 Scheme)

13.606.3 : SWITCHED MODE POWER CONVERTERS (E)

Time : 3 Hours

Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries **2** marks.

1. Explain the principle of volt-second balance in inductors.
2. Obtain the expression for output voltage ripple of an ideal buck boost converter operating in continuous conduction mode.
3. Define the terms DPF, THD and explain its significance.
4. What is meant by ZVS and ZCS ?
5. Explain the concept of switch utilization factor in three phase inverters.
6. What are the advantages of switched mode power supply over linear power supply ?
7. What is the need of power conditioners in power system ?
8. Describe the classification of load resonant converters.
9. Explain the concept of programmed harmonic elimination.
10. Describe the impact of dead time in the operation of inverters. **(2×10=20 Marks)**

P.T.O.



PART – B

Answer **one full** question from **each** Module.

Module – I

11. a) Explain the operation of a step down converter in continuous conduction mode and obtain the expression for voltage gain and output voltage ripple. **10**
- b) For a boost converter, consider all components to be ideal. The input voltage varies between 8 V to 16 V, output voltage is 24 V, switching frequency is 20 kHz and capacitance is 470 μF . Calculate the minimum value of inductance that will keep the converter in continuous conduction mode if output power is greater than or equal to 5 W. **10**

OR

12. a) Explain the bipolar and unipolar PWM switching schemes used in full bridge dc-dc converters. **10**
- b) For a buck-boost converter the output voltage is 15 V, operating duty ratio is 0.4, output power is 10 W and the switching frequency is 20 kHz. Determine the inductance value so that the converter is operating in boundary between continuous and discontinuous conduction. Also choose capacitance value, if the permitted output voltage ripple is 1%. **10**

Module – II

13. a) Describe how you will choose a switching frequency, in sinusoidal PWM, in the linear range. **8**
- b) With the help of neat diagram explain the three phase sine PWM inverter operation. **12**

OR

14. a) Show that in sinusoidal PWM, the amplitude of fundamental frequency component of the output voltage varies linearly with the amplitude modulation ratio m_a , provided $m_a \leq 1$. **10**
- b) Explain the tolerance band (current mode) control, of switched mode inverter. **10**



Module – III

15. a) With the relevant waveforms, explain the working of series loaded resonant dc-dc converter in discontinuous conduction mode for switching frequency ω_s less than half the resonant frequency ω_0 . **15**
- b) Describe the characteristics of an undamped series resonant circuit. **5**

OR

16. a) Explain the working of a ZVS resonant switch dc-dc converter. **15**
- b) Write a short note on classification of resonant converters. **5**

Module – IV

17. a) A forward converter has an input voltage of 200 V and a switching frequency of 50 kHz. Number of turns in primary winding, secondary winding and demagnetizing winding are 80, 60 and 20 turns respectively. The operating duty ratio is 0.2. For this converter :
- i) Sketch the variation of voltage across demagnetizing winding
 - ii) Obtain the peak voltage to be withstood by the switch and
 - iii) Obtain the maximum permissible duty cycle. **12**
- b) Explain the power line disturbances caused by switching power converters. **8**

OR

18. a) Explain the working of flyback converter with necessary derivations and waveforms. **12**
- b) For a push-pull converter, output voltage is 20 V, load resistance is 2Ω , inductor current ripple is 5%, duty ratio of each switch is 0.3 and switching frequency is 10 kHz. Sketch the diode current and inductor current, clearly indicating salient points. **8**

