Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019

Course Code: EE364

Course Name: SWITCHED MODE POWER CONVERTERS

Max. Marks: 100 Duration: 3 Hours

Graph Sheets will be provided

PART A

Answer all questions, each carries5 marks.

			Marks
1		Obtain the input-output voltage and current relation as a function of duty ratio for a Boost dc-dc converter in continuous conduction mode.	(5)
2		What is linear power supply? Mention the drawbacks of linear power supply.	(5)
3		Explain the basic concept of a push pull converter derived from buck converter.	(5)
4		Define the terms amplitude modulation ratio and frequency modulation ratio in a PWM switching scheme.	(5)
5		Compare PWM technique and space vector modulation technique.	(5)
6		Explain the concept of tolerance band current control technique.	(5)
7		What is meant by resonant converters? How are they useful in SMPC applications?	(5)
8		Briefly explain the characteristics of an undamped series resonant circuit.	(5)

PART B

Answer any two full questions, each carries10 marks.

9	a)	For an ideal buck converter, derive the value for L_{crit} in terms of duty cycle, switching frequency, and load at the boundary of discontinuous conduction mode (DCM) and continuous conduction mode (CCM).	(5)
	b)	In a step up converter, consider all components to be ideal. Let V_d be 8-16 V, Vo= 24V, f_s = 20kHz, and C = 470µF. Calculate L_{min} that will keep the converter operating in continuous conduction mode if $P_0 \geq 5W$.	(5)
10	a)	With help of neat sketches derive the expression for the voltage ripple in an ideal buck-boost converter.	(5)

b) In a Cuk converter shown in Figure 1, operating at 50 kHz, $L_1 = L_2 = 1$ mH and $C_1 = 5$ µF. The capacitor is sufficiently large to yield an essentially constant output voltage. Here, $V_d = 10$ V and the output V_0 is regulated to be constant at 5V. It is supplying 5 W to a load. Assume ideal conditions. Calculate the RMS current flowing through the capacitor C_1 (5)

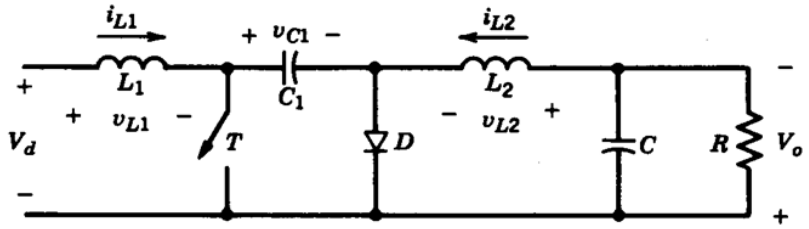

Figure 1

11 a) With help of neat sketches explain the operation of full bridge DC-DCconverter with biplar voltage switching scheme. (6)

b) Write a short note on the electrical isolation in DC-DC converters. (4)

PART C

Answer any two full questions, each carries10 marks.

12 a) With help of neat sketches explain the operation of a flyback converter (6)

b) A forward converter with a demagnetising winding is designed to operate with a maximum duty ratio D_{max} of 0.7. Calculate the voltage rating of the switch interms of input voltage V_d. (4)

13 a) With help of relevant sketches explain the operation of a full bridge DC power supply. (5)

b) Explain the control of a single phase full bridge inverter with PWM unipolar voltage switching scheme. (5)

14 a) How the output voltage of a single phase inverter is controlled using voltage cancellation technique? Explain. (5)

b) Explain the operation of a three phase inverter with square wave switching scheme. (5)

PART D

Answer any two full questions, each carries 10 marks.

15 a) Explain the concept of space vector and space vector modulation technique. (5)

b) Explain the concept of programmed harmonic elimination switching scheme to (5)

control the inverter output.

16 a) Write a short note on the current mode control of inverters (3)

b) Explain the operation of a ZCS resonant converter with necessary figures and circuit diagram. (7)

17 a) With help of neat circuit diagram and relevant waveforms, discuss the operation of series loaded resonant dc-dc converter in discontinuous current conduction mode. (7)

b) Compare zero voltage switching (ZVS) and zero current switching(ZCS) (3)