

**APJ ABDUL KALAM TECHNOLOGICAL
UNIVERSITY**

08 PALAKKAD CLUSTER

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Name:

Reg No:



FIRST SEMESTER M.TECH. DEGREE EXAMINATION DEC 2015

M-Tech POWER ELECTRONICS

08EE6231

ANALYSIS OF POWER ELECTRONICS CIRCUITS I

Time:3 hours

Max.marks: 60

Answer all six questions. Part 'a' of each question is compulsory.

Answer either part 'b' or part 'c' of each question

Q.no.	Module 1	Marks
1.a	What is the two transistor model of Thyristor? Explain?	3
Answer b or c		
b	A 230 V, 50 Hz supply is connected to a single phase transformer which feeds a diode bridge rectifier. Primary to Secondary turns ratio for transformer is 0.5 & Load RL has a ripple free current $I_0 = 10A$. Determine a) Average value of output voltage b) Input current distortion factor c) Input displacement factor d) input Power factor e) input current harmonic factor HF or THD f) Crest Factor	6
c	Derive the expression for the average output voltage for firing angle of a) $\alpha < 30^\circ$ b) $\alpha > 30^\circ$ in a three phase half wave SCR converter ?	6
Q.no.	Module 2	Marks
2.a	A Single phase fully controlled bridge converter supplies an inductive load. Assuming that the output current is constant. And is equal to I_d , determine the following performance measures, if the supply voltage is 230V and if the firing angle is maintained at $(\pi/6)$ radians (a) Average output voltage (b) Supply RMS current (c) Supply Fundamental RMS current (d) Displacement factor (e) Supply PF	3
Answer b or c		
b	Describe in detail the operation of dual converter?	6

- c Discuss the effect of source inductance on the performance of a single phase full converter ? indicating clearly the conduction of various thyristors during one cycle ? 6

Q.no.	Module 3	Marks
3.a	Explain current limit control in DC-DC Converter?	3

Answer b or c

- b Draw the power circuit diagram for a Current Commutated Chopper. Explain the working of this chopper with relevant waveforms? 6
- c For a current commutated chopper peak commutating current is thrice, the maximum possible load current. The Source voltage is 220V DC and the main SCR Turnoff time is $20\mu\text{s}$. For a maximum current of 180A, Compute 6
- (a) the value of commutating components L&C (b) Maximum Capacitor Voltage and (c) Peak Commutating Current

Q.no.	Module 4	Marks
4.a	What are the different types of controllers used in the AC Voltage Controllers?	3

Answer b or c

- b Discuss the working of a Two stage sequence control of voltage regulators for both R and RL Loads. What is the advantage of this Regulator over a single phase full wave voltage regulator.? 6
- c For a Single phase AC Voltage regulator feeding a resistive load, Draw the waveforms of Source Voltage, Gating signals, Output voltage and output currents and voltage across SCRs Describe its working with waveforms drawn 6

Q.no.	Module 5	Marks
5.a	Write a short note on TCR & TSC	4

Answer b or c

- b Explain the working of single phase to single phase cycloconverter with RL Load? 8
- c Analyze the operation of three phase to single phase cycloconverter? 8

Q.no.	Module 6	Marks
6.a	What is the basic principle of Boost Inverter ? and explain its circuit operation?	4
Answer b or c		
b	With the help of a neat circuit Diagram and waveforms, explain briefly the operation of transistorized three phase bridge inverter with resistive load in 120° conduction mode and compare its merits and demerits over 180° mode.	8
c	A Single phase half bridge inverter has a resistive load of $R=2.4 \text{ Ohm}$ and the DC input voltage is $V_s=48 \text{ V}$. Determine (a)the RMS output voltage at the fundamental frequency.(b) output Power (c)average and peak current of each thyristor (d) Peak reverse voltage of each thyristor(e)THD (f) DF of the lowest order harmonics	8