APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY
08 PALAKKAD CLUSTER

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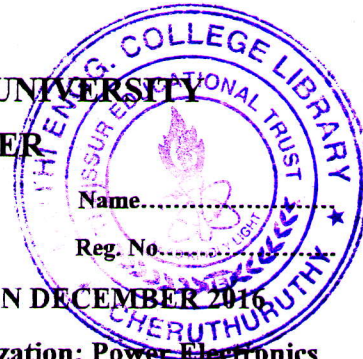
FIRST SEMESTER M.TECH. DEGREE EXAMINATION DECEMBER 2016

Branch: Electrical & Electronics Engineering   Specialization: Power Electronics

08EE 6231 Analysis of Power Electronic circuits

Time:3 hours   Max.marks: 60

Answer all six questions.

Modules 1 to 6: Part 'a' of each question is compulsory and answer either part 'b' or part 'c' of each question.

(Graph sheets can be provided)

Q.no.	Module 1	Marks

1.a (i) Draw v-i characteristics of a thyristor. What is the effect of gate current on this characteristics?   **3**

(ii)What are the applications of power diodes?

Answer b or c

b In a full wave rectifier, a diode with 100 ohm internal resistance supplies a load of 1 KΩ. If the input voltage is 250 sin314t, find (i) maximum current (ii) DC value of current (iii) RMS value of output current (iv) Rectifier efficiency (v) Ripplefactor (vi)compare the efficiency and ripple factor with that of a half wave rectifier.   **6**

c Draw a neat schematic diagram of a 3 phase halfwave rectifier with R-L load and explain its working with neat voltage and current waveforms. Derive the performance parameters (i) Average load voltage (ii) Ripple factor, and (iii) Transformer utilization factor.   **6**

Q.no	Module 2	Marks

2.a (i)What is meant by commutation in thyristor power converters?   **3**

(ii)Give the relation between power factor and displacement factor in converters.

Answer b or c

b The output of a single phase midpoint rectifier is 10A,100V DC while the input supply is 250V AC. Find the the transformer rating,voltage ratio and transformer primary current. Assume the firing angle to be 30 degree and the load be inductive . **6**

c With the help of a neat schematic diagram and waveforms explain effect of overlap , and derive the expression for DC output voltage due to commutation for a single phase fullwave rectifier with R-L load. **6**

Q.no	Module 3	Marks

3.a (i) Draw a type - E chopper. How the switching operation in a DC chopper can be controlled? **3**

(ii) What are the disadvantages of DC choppers? How it can be rectified?

Answer b or c

b Draw and explain the the working of a Cuk DC-DC converter and derive the expressions for average output voltage and ripple current. Comment on the effect of switching frequency on the performance of the converter. **6**

c (i)what is a switched mode regulator? **6**

(ii) A Buck regulator has a switching frequency of 10KHz.If the output voltage is fixed at 50V across a 5 ohm load resistance and if input voltage be 150V, L=200μH , Find the duty cycle of the chopper and average load current. Also find the current through the inductance , the average values of diode current and inductor current.

Q.no	Module 4	Marks

4.a (i) Give the classification of AC voltage controllers.? What is two stage sequence control of AC voltage regulators? **3**

Answer b or c

b With the help of neat circuit and waveforms ,explain the working of a three phase three wire voltage regulator feeding a star connected load , for firing angles of less than and greater than 60 degree. Also derive the expressions for RMS values of phase currents . **6**

c	A half wave AC voltage controller supplies power to a pure resistance load of 10 ohms from a 230 V , 50hz power supply. Find the load RMS voltage , input power factor, the average value of thyristor current,and the RMS value of diode current.	6

Q.no	Module 5	Marks

| 5.a | What is cycloconversion? What are the factors affecting harmonics in cycloconverters?Give a comparison between cycloconverter and DC link converter. | 4 |

Answer b or c

b	(i) Draw the schematic diagram and output voltage waveforms for a three phase to three phase cycloconverter with RL load and explain its working .	8
	(ii) List the advantageous and dis advantageous of cycloconverters .	
c	Write short note on (i) thyristor control reactor	8
	(ii)A three pulse cycloconverter has output voltage of 250V to feed a single phase load at 50A.If the load power factor is unity ,find the input power per phase and the power factor	

Q.no	Module 6	Marks

| 6.a | (I) Draw the block diagram of uninterruptible power supply. | 4 |
| | (ii) Illustrate the principle of operation of inversion and give its classification. | |

Answer b or c

b	Explain current source inverters and list their characteristic features. Compare current source inverters with voltage source inverters.	8
c	Write short notes on modulation index,boost inverter,total harmonic distortion and sinusoidal pulse width modulation	8

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