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M.TECH
PEPC101, PPPC102

1ST Semester Back Examination – 2016-17

POWER CONVERTER-I

Branch: PED, PE, PEED

Time: 3 Hours

Max Marks: 70

Q.CODE: Y951

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: (2 x 10)

- What are the advantages of freewheeling diode?
- What is line commutated inverter?
- What is the difference between symmetrical & unsymmetrical semiconverter?
- What are the major draw backs of phase controlled rectifiers?
- What are the advantages of pwm inverter over stepped wave inverter?
- What is the difference between chopper and aacregulator?
- What is the effect of blanking time on inverter voltage?
- Differentiate between unipolar & bi-polar switching scheme
- How the filter size is affected by switching frequency?
- What are the effects of over modulation in case of inverter?

Q2 a) With suitable diagram & waveform, explain the operation of a single-phase fully controlled rectifier with R-L load and derive the expression for average output voltage. (5)

b) A single phase semi converter is operated from 230V, 50 Hz ac supply. The load current is continuous and ripple free with an average value of 5A. For firing angle of $\alpha = \pi/4$, determine (i) THD of input current (ii) Rectification Efficiency. (5)

Q3 a) Explain the operation of a three-phase half wave converter with R-L load with neat diagram and derive the expression for average output voltage. (5)

b) Draw and explain the operation of a three-phase full converter with R-L-E load under continuous conduction with appropriate waveforms of (a) Output Voltage (b) Load current (c) phase-A supply current for a firing angle of 60° . (5)

Q4 a) Explain the operation of a circulating current mode dual converter with suitable circuit diagram and waveforms. How circulating current mode is (5)

different from non-circulating current mode?

- b) A single phase full wave ac voltage controller has a R-L load of $R=10\Omega$ & $L=10\text{mH}$ and the input voltage is $V_s=230\text{V}$, 50 Hz . Determine (a) critical firing angle & (b) for a delay angle of 60° and extinction angle of 200° , the rms value of the output voltage. (5)

- Q5 a) Describe the operation of Type-A chopper with suitable circuit & waveform and find the output performance. (5)

- b) For a type-A chopper the input voltage is 200V and the load resistance is 20Ω . When the chopper is on, its voltage drop is 1.5V . If the chopping frequency is 10 KHz and the duty cycle is 80% , find (i) Average output voltage (ii) RMS output voltage (iii) off time of the chopper. (5)

- Q6 a) Describe the operation of push-pull inverter with neat circuit diagram & waveforms. (5)

- b) For a single phase full bridge inverter explain the unipolar voltage switching scheme with suitable diagram and waveforms. (5)

- Q7 a) Draw and explain the 180° conduction mode operation of a $3-\phi$ VSI with suitable waveforms of gate pulses, phase voltages & line voltages. (5)

- b) Derive the expression of the RMS value of phase voltage, line voltage and the THD content of phase voltage for the above problem. (5)

- Q8 Write short notes on any two: (5 x 2)

- a) Multi-pulse modulation
b) Four-Quadrant chopper
c) Three phase ac voltage regulator