

Roll No

MEPE - 104

M.E./M.Tech., I Semester

Examination, June 2016

Forced Commutation Circuits

Time : Three Hours

Maximum Marks : 70

- Note :** i) Attempt any five questions.
ii) All questions carry equal marks.

1. a) Explain the operating principle of inverter with suitable diagram. Draw the voltage and current waveforms of inverter. Derive the expression for rms output voltage.
b) A three phase bridge inverter is fed from 600V dc supply. If the semiconductor switches which are used in inverter conducts for 120° duration and the inverter is supplying a star connected resistive load of 10Ω , determine
(i) rms value of per phase voltage and line voltage
(ii) rms value of load current (iii) rms value of current flows through switches (iv) power delivered to load.
2. a) What is the need for controlling the output voltage of an inverter? What are different techniques used to control the output voltage of an inverter? Explain in brief.
b) A single phase bridge inverter delivers power to a series connected RLC load with $R = 2\Omega$ and $\omega L = 10\Omega$. The periodic time $T = 0.1$ m sec. What value of C should the load have in order to obtain load commutation for the SCRs. The thyristor turn-off time is 10μ sec. Take circuit turn-off time as $1.5 t_q$. Assume that load current contains only fundamental component.

3. a) Draw the circuit diagram of a single phase full bridge voltage source inverter with RL load and explain its operating principle. Derive the expression for
- i) rms value of output voltage
 - ii) rms value of fundamental components
 - iii) output load current
- b) What is the need for harmonic reduction in output voltage of an inverter? What are the different methods used for harmonic reduction in output voltage of inverter? Explain.
4. a) Explain the operating principle of dc chopper with a suitable diagram. Draw the voltage and current waveforms of chopper. Derive expressions for average and rms output voltages.
- b) In a battery operated chopper fed dc drive, the maximum possible value of accelerating current is 425A, the lower limit of current pulsation is 180A. The ON period of switch is 14ms and off period of switch is 11ms and the time constant is 63.5ms. Find the higher limit of current pulsation. Assume battery voltage $V = 200V$ and $R = 0.1 \Omega$.
5. a) What is switch mode power supply? Describe the operation of fly back SMPS with wave forms.
- b) Describe the resonant mode of operation of power supply with a neat diagram and waveforms.

6. a) Draw and explain the medium frequency power supply for induction heating.
- b) Describe the laser power supply. Write down limitations.
7. a) Draw and explain the operation of power supply for switched reluctance motor drive.
- b) A 15hp 300V, 1000rpm separately excited dc motor can be controlled by a three-phase semi converter which is supplied by Y-connected 220V, 50Hz ac supply. The motor armature resistance $R_a = 1.0 \Omega$ and armature current is continuous and ripple free. If the motor operates at 900 rpm at firing angle $\alpha = 45^\circ$, determine the rms value of source and thyristor currents.
8. Write a short notes on any two of the following:
- a) Power supply for AC drive
 - b) High frequency sources for fluorescent lamps
 - c) Current sourced inverter
 - d) Commutation techniques
