Roll No ....

MEPE - 104

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

Examination, December 2015

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 operation of single phase bridge inverter with the help of load voltage and load current waveforms.

   b)   What is the need for controlling the output at the output terminals of an inverter? Discuss briefly and compare the various methods employed for the control of output voltage of inverters.

2. With an appropriate power diagram, discuss the principle of working of a three-phase bridge inverter. Draw phase and line voltage waveforms on the assumption that each thyristor conducts for $180°$ and the resistive load is star connected. Also prepare a table which shows the sequence of firing of various SCRs.

3. a)   State the need for reduction of harmonics in inverters. Outline the various methods for reduction of harmonics or the improvement in wave shap.

   b)   Give performance comparison of PWM, AVI and CSI.

4. a)   Draw the circuit of a two quadrant chopper and explain its working.

   b)   A load commutated chopper, fed from a 230V dc source has a constant load current of 50A for a duty cycle of 0.4 and a chopping frequency of 2kHZ calculate,

   i)   The value of commutating capacitance

   ii)   Average output voltage

   iii)   Circuit turn-off time for one SCR pair

   iv)   Total commutation interval

5. a)   With the help of a block diagram explain the basic principle of operation of SMPS.

   b)   Compare dielectric heating with induction heating.

6. a)   Explain the principle of induction heating. Enlist the merits of induction heating over conventional method.

   b)   With the help of block diagram, explain the operation of electronic lamp ballast.

7. a)   Draw the circuit diagram and explain the operation of chopper fed d.c. series motor. Also derive the expression for I_{max} and I_{min} assuming a continuous armature current.

   b)   An 80kW, 440V, 800rpm dc motor is operating at 600 rpm and developing 75% rated torque is controlled by 3-ϕ, six-pulse thyristor converter. If the back emf at rated speed is 410V, determine the triggering angle of the converter. The input to the converter is 3-ϕ, 415V, 50HZ ac supply.

8. Write a short notes on any two of the following:

   a)   Induction welding

   b)   Laser power supply

   c)   Safe operating area

   d)   Commutation techniques

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