5. a) What is a cycloconverter? Enumerate some of its industrial applications.

   b) Draw the possible configurations of a single-phase voltage controller and compare them.

   c) A single-phase voltage controller has input voltage of 230V, 50 Hz and a load of R = 15Ω, for 6 cycles on and 4 cycles off, determine: (i) rms output voltage (ii) input power factor.

   d) Describe 3-phase to 3-phase cycloconverter with relevant circuit arrangements using 18 SCRs and 36 SCRs.

OR

Discuss the operation of Cuk converter with the help of a circuit diagram and voltage and current waveforms.

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Roll No .

EE-604

B.E. VI Semester

Examination, June 2016

Power Electronics

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each question are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max. 400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

1. a) What do you mean by commutation of SCR? What are the different classes of forced commutation method?

   b) Describe the various types of power diodes.

   c) Describe the switching characteristics of power MOSFETs.

   d) Discuss how a thyristor may be subjected to internal and external over voltages. Describe the methods adopted for suppressing such over voltages in thyristor systems.

OR

Discuss the problems associated with parallel operation of SCRs and how these are over come.

2. a) State the limitations of uncontrolled rectifier.

   b) Explain the basic principle of phase controlled operation.

   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.

   d) A single-phase fully controlled bridge converter supplies an inductive load. Assuming that the output current is virtually constant and is equal to Id, determine the following performance measures, if the supply voltage is 230V and if the firing angle is maintained at ($\pi/6$) radians.

      i) Average output voltage

      ii) Supply rms current

      iii) Supply fundamental rms current

      iv) Fundamental power factor

      v) Supply power factor

OR

With the help of neat circuit diagrams and waveforms, explain the operation of 3-phase fully controlled bridge converter with RL load.

3. a) Explain the principle of operation of an inverter.

   b) Explain the cross conduction or shoot through fault in inverters. How will you overcome it?

   c) List different voltage control and PWM techniques use in 1-ϕ inverter.

   d) Draw a circuit of auxiliary - commutated single-phase bridge inverter and explain its operation by drawing voltage and current waveforms.

OR

With an appropriate power diagram, discuss the principle of working of three-phase bridge inverter. Draw phase and line voltage waveforms on the assumption that each thyristor conducts for 120° and the resistive load is star connected.

4. a) State the performance parameters for choppers.

   b) Describe the salient features of a voltage commutated chopper.

   c) Explain with appropriate waveforms, the different control strategies used for obtaining variable output voltage from a dc chopper.

   d) With the help of basic power circuit diagram, explain the working of current commutated chopper. Also draw the associated waveforms.

OR

Describe a Morgan Chopper with associated voltage and current waveforms. Enumerate the demerits of Morgan Chopper compared to Jones Chopper.