

[4]

- d) Draw the basic circuit diagram of a cuk regulator and explain its working. Obtain an expression for the output voltage.

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Explain the working of a dual converter in the circulating current mode.

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Total No. of Questions : 5]

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**EE-604**

**B.E. VI Semester**

Examination, December 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.

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**Unit - I**

1. a) What is Latching device? Give examples.  
b) In what way a GTO is different from a thyristor?  
c) Explain how a capacitor connected in parallel to a thyristor limits the  $\left(\frac{dv}{dt}\right)$   
d) Explain with a proper circuit diagram and waveform the method of RC triggering for the gate of a thyristor that produces pulses for every positive half cycle of AC supply voltage.

OR

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With the help of relevant waveform explain a class D commutation circuit.

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### Unit - II

2. a) Define the conduction angle for a thyristor.
- b) What is meant by single quadrant converter and two quadrant converter.
- c) A three phase half wave fully controlled converter is connected to 400V, 50Hz Ac source. The load consists of a resistance in series with a large inductive reactance. The load current can be assumed to be constant at 38A. Find out the
  - i) Thyristor firing angle for an average load voltage of 191V.
  - ii) Current rating of the thyristor
  - iii) PIV across the thyristor
- d) Discuss the effect of source inductance in the performance of a single phase fully controlled full wave bridge rectifier.

OR

A three phase semi converter supplies a purely resistive load. Draw the bridge circuit and relevant waveforms and explain its working and derive an expression for the output voltage for  $\alpha < 60^\circ$ .

### Unit - III

3. a) Distinguish between a current source inverter and voltage source inverter.
- b) Explain the principle of pulse width modulation.
- c) Explain the internal control of inverter.

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- d) Explain with circuit diagram and waveforms the operation of a three phase inverter with mode 180° conduction. Assume star connected resistive load.

OR

What are the various inverter harmonic control techniques and list the effects of eliminating lower order harmonics.

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### Unit - IV

4. a) Why an IGBT is preferred to a thyristor in chopper circuits?
- b) Why in a step down chopper, the source current is discontinuous?
- c) Explain the principle of step down chopper.
- d) The DC supply to a basic chopper is 400V. The duty ratio is 0.6. The load consists of a resistance, an inductance of 40 mH and an emf. Find the chopping frequency to limit the amplitude of ripple current to 9A. Assume that the current varies linearly with time and it is continuous.

OR

Explain the operation of a voltage commutated thyristor chopper. Draw the necessary waveforms.

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### Unit - V

5. a) Define the term duty cycle in the method of ON-OFF control.
- b) The frequency of supply voltage in a single phase step-down cyclo-converter is 50Hz. If the output voltage has four pulses in a half cycle. What is the frequency of the output?
- c) Show that in a boost regulator the average load current is less than the average inductor current.