Roll No.

EI - 504

B.E. V Semester

Examination, June 2015

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 questions 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.

Unit-I

1. a) Give the classification of power diode and draw v.i. characteristics of the power diode.

b) Draw and explain static VI characteristics of GTO in brief.

c) What is triac? Give its symbol and draw its VI characteristics.

d) Give the classification of power transistors. Explain the equivalent circuit and function of IGBT'S. How it is different from BJT's and MOSFETS.

OR

Describe the construction, working operation of depletion. Type of MOSFETS. Also give its steady-state characteristics with brief explanation.

Unit-II

2. a) Define peak inverse voltage and its value in a half wave rectifier circuit.

b) Find out the value of rectification efficiency of single phase full wave rectifier circuit.

c) Give the advantages and disadvantages of bridge rectifier over centre-tap rectifier in brief.

d) Explain the use of flywheel diode in single phase full wave fully controlled rectifier circuit. Show its effect mathematically proved (Give the circuit diagram).

OR

A full wave rectifier with 20V rms sinusoidal input has a load resistance of 1kΩs.

i) If silicon diodes are employed, what is the d.c. voltage available at the load?

ii) Determine the PIV rating of each diode.

iii) Find the maximum current through the diode during conduction.

iv) What is the required power rating of each diode.

Unit-III

3. a) Why is it necessary to remove harmonics from the output of an inverter.

b) Explain the term duty cycle and chopper frequency.

c) Give the classification of choppers based on quadrant operation.

d) Describe various most commonly used techniques for pulse width modulation in brief with the help of diagrams.

OR

Discuss the buck-boost regulator with circuit arrangements and draw its output waveforms.

Unit-IV

4. a) What is the control range of delay angle for single phase bidirectional controllers?

   b) What are the different applications of cycloconverter in the industry?

   c) Give the various industrial applications of a.c. controllers.

   d) A single phase full wave a.c. controller has a resistive load of 10 ohms and an input voltage of 120 volts at 50Hz. The fixing angles of SCR-1 and SCR-2 is $\pi/2$.

   Calculate :

   i) The rms value of load voltage

   ii) input power factor

   iii) average value of current of SCR

   iv) rms value of SCR, Ir.

OR

Show that the fundamental rms value of par phase output voltage of low frequency for m-pulses cycloconverter is given by $V_{or} = V\left(\frac{m}{\pi}\right)\sin\left(\pi/m\right)$

Express V_{or} in terms of voltage reduction factor.

Unit-V

5. a) What do you mean by induction heating?

   b) Give the circuit diagram of Relay using solid state device.

   c) Explain resistance welding and welding cycle in brief.

d) Describe the Battery charging regulator used for automobile with the help of circuit diagram.

OR

Explain Sawtooth generator with the help of circuit diagram using GTO. Also give the wave-forms of the generator. What is the utility of the above in the industrial field.

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