

5E5041

B.Tech. V Semester (Main/Back) Exam., Nov./Dec.-2016

Electrical & Electronics Engineering

5EX1A POWER ELECTRONICS

EX, EE

Time: 3 Hrs.

Maximum Marks: 80

Min. Passing Marks Main: 26

Min. Passing Marks Back: 24

Instructions to Candidates:

Attempt any five questions, selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205)

1. NIL.....

2. NIL.....

Unit-I

- Q.1 (a) What are the differences in the gating characteristics of thyristors & transistors? [8]
 (b) What are the differences between enhancement type MOSFETs & depletion type MOSFETs? [8]

OR

- Q.1 (a) Briefly explain the V – I characteristics of an IGBT. [8]
 (b) Give the merits & demerits of a GTO as compared to a conventional SCR. [8]

Unit-II

- Q.2 (a) The gate circuit of an SCR has a source voltage of 15V & the load line has a slope of 120V per ampere. The minimum gate current to turn-on the SCR is 25mA. Calculate: [8]
 (i) Gate – source resistance R_s .
 (ii) The gate voltage & gate current for an average gate power dissipation of 0.4 watts.
 (b) What is the purpose of having parallel operation of SCRs? What care must be taken when paralleling the SCRs? [8]

OR

Q.2 (a) Explain the various types of triggering methods of SCR briefly. Which is the universal method & why? [8]

(b) What are $\frac{dv}{dt}$ & $\frac{di}{dt}$ rating of SCRs? What happens if these rating are exceeded?

Explain.

[8]

Unit-III

Q.3 (a) Explain with a neat circuit diagram the basic principle of a dual converter. [8]

(b) For 3 - ϕ full converter operating from 3- ϕ , 415/50Hz supply, determine & plot the following- [8]

(i) Fundamental component of the supply current.

(ii) 5th, 7th, 11th & 13th harmonics for $\alpha = 0^\circ, 30^\circ, 60^\circ, 90^\circ, 120^\circ, 150^\circ$

Assume large inductive load with $R_L = 10\Omega$.

OR

Q.3 (a) Describe working of a single phase full converter with RLE load through the waveform of supply voltage, load voltage, load current & voltage across thyristor. Also derive expression for load voltage & input power factor. [8]

(b) A single phase half wave controlled converter is operated from a 120V, 50Hz supply. Load resistance $R = 10\Omega$. If the average output voltage is 25% of the minimum possible average output voltage, determine :

[8]

(i) Firing angle

(ii) rms & average output current

(iii) rms & average SCR current

Unit-IV

Q.4 (a) Explain with associated waveform, how power factor can be improved with symmetrical angle control scheme. [8]

(b) A single-phase semi converter is operated from 200V, 50Hz source. If load resistance $R = 8\Omega$ & source has an inductance of 1.5mH, for an firing angle delay of 60° , determine :

[8]

(i) Average output voltage

(ii) The angle of overlap

OR

- Q.4 (a) Explain in detail the sinusoidal pulse width modulation control scheme for power factor improvement. [8]
- (b) Describe the working of a single phase semi converter with RL load, through the waveform of supply voltage, load voltage, load current & voltage across thyristor & also derive expression for load voltage & input power factor. [8]

Unit-V

- Q.5 (a) What is the principle of operation of a step down chopper? [8]
- (b) A DC chopper circuit connected to a 100V DC source supplies an inductive load having 40mH in series with a resistance of 5Ω . A free wheeling diode is placed across the load. The load current varies between the limits of 10A & 12A. Determine the time ratio of the chopper. [8]

OR

- Q.5 (a) Explain multiphase chopper along with relevant circuit diagram & waveform. [8]
- (b) Explain working principle of type-A chopper along with relevant circuit diagram & waveform. [8]



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