

Duplicate

Roll No.

Total Pages : 3

307403

May, 2019

B.Tech. (EL) - IV SEMESTER

Power Electronics-1 (ELPC403)

Time : 3 Hours]

[Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART-A

1. (a) What is power electronics? (1.5)
- (b) What is a time constant of an R-L circuit? (1.5)
- (c) What is a freewheeling diode and what is its purpose? (1.5)
- (d) What is turn on time of thyristor? (1.5)
- (e) Does the input power factor of converters depend on the load power factor? (1.5)
- (f) What are harmonics? (1.5)

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- (g) What is a latching current of thyristors? (1.5)
- (h) What is the input power factor? (1.5)
- (i) What is MOSFET ? (1.5)
- (j) What is modulation index? (1.5)

PART-B

2. (a) Discuss V-I characteristics of thyristor and define terms related to it. (10)
 (b) Compare the devices BJT, MOSFET and IGBTs. (5)

3. (a) Draw and explain the working of R and RC firing circuits. (5)
 (b) What is commutation ? Discuss different methods of commutation with the help of circuit diagrams and suitable waveforms. (10)

4. Describe the working of a single phase full wave fully controlled SCR based converter with R L load through the waveforms of supply voltage, load voltage, load current and voltage across the SCR at an firing angle $\alpha = 60$ degree. Assume continuous load current.
 Also derive an expression for the load current in terms of supply voltage, load impedance and firing angle etc. (15)

5. (a) A DC-DC buck converter supplies a separately excited dc motor with a supply voltage $V_s = 240$ V and back emf $E_b = 100$ V. Other data are; total inductance $L = 30$ mH, armature resistance $R_a = 2.5$ ohm, chopper frequency = 200 Hz, and duty cycle = 50%. Assuming continuous current determine (i) minimum instantaneous load current (ii) maximum instantaneous load current (iii) peak to peak current ripple. (10)
 (b) Discuss the operation of a DC-DC boost converter with circuit diagram and suitable waveforms. (5)

6. (a) Explain the principle of working of three phase bridge voltage source inverter with an appropriate circuit diagram through phase and line voltage wave forms on the assumption that each thyristor conducts for 120 degree and the resistive load is delta connected. Also indicate the sequence of firing of various thyristors. (10)
 (b) What are the main differences between voltage source and current source inverters? (5)

7. Write short notes on the following :
 (a) Single-phase voltage source inverter.
 (b) Three-phase sinusoidal modulation.
 (c) Gate drive circuits for MOSFET and IGBT. (15)