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Total Number of Pages : 02

B.Tech.
PCEL4301

5th Semester Back Examination 2017-18

Power Electronics

BRANCH: AEIE, EEE, EIE

Time: 3 Hours

Max Marks: 70

Q.CODE: B245

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions :

(2 x 10)

- What do you mean by holding current and latching current of a Thyristor ?
- Draw the static characteristics of a TRIAC and enumerate its use.
- Differentiate between Converter Grade and Inverter Grade Thyristor.
- What do you mean by power diode and how is it different from signal diode?
- A resistive load of 10Ω is connected through a full-wave bridge SCR circuit to 220V, 50Hz, single-phase source. Calculate the average output voltage at load for a firing angle of 60° .
- What is a power MOSFET. What is its rating?
- What are the advantages of free wheeling diode in a phase controlled converter?
- What is the relation between input voltage V_s and output voltage V_o of a step-down DC Chopper?
- Define I_{TAV} and V_{SF} .
- Draw the circuit of a single phase bridge type step down Cyclo-converter.

Q2 a) Snubber circuit of an SCR should primarily consist of a capacitor but a resistor is used in series with it. Discuss why it is so. (5)

- b) Following are the specification of a thyristor operating from a peak supply of 500 volts, Repetitive peak current, $I_p = 250\text{amps}$, $(di/dt)_{max} = 60\text{amps}/\mu\text{s}$, $(dv_a/dt)_{max} = 200\text{v}/\mu\text{s}$, take a factor of safety 2 for the three specifications mentioned above. Design a suitable snubber circuit if the minimum load resistance is 20 ohm. Take $\xi = 0.65$. (5)

Q3 a) A single phase one-pulse converter with RLE load has the following data: (5)

Supply voltage = 230 V, 50 Hz, $R = 2 \Omega$, $L = 1 \text{ mH}$, $E = 120 \text{ V}$, Extinction angle = 220° , firing angle = 25° . Calculate the

- voltage across thyristor at the instance SCR is triggered,
- voltage that appears across SCR when current decays to zero,
- peak inverse voltage for the SCR.

- b) Draw the waveform of source voltage, source current, load voltage and load current of single phase full controlled converter for discontinuous load current with R-L load. (5)

Q4 a) Compare IGBT and SCR. (5)

- b) Draw and explain switching characteristics of an SCR and comment on its suitability for use as a switching device. (5)

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Q5 a) Discuss single and two quadrant operation of chopper with DC motor load. **(5)**

b) A step up chopper has input voltage of 220 V and output voltage of 660 V. if the conducting time of thyristor chopper is $100 \mu s$, compute the pulse width of output voltage. In case out put voltage pulse width is halved for constant frequency operation, find the average value of new output voltage. **(5)**

Q6 a) Describe the operation of Single phase midpoint type step up Cyclo-converter for discontinuous load current . **(5)**

b) Describe the operation of single phase ac voltage controller with integral cycle control and derive the expression for rms value of output voltage V_{or} and supply voltage V_s . **(5)**

Q7 Discuss the operation of 3 phase inverter with 120° conduction mode for 3 phase star connected resistive load. Draw the switching pattern, phase and line voltage waveforms. Enumerate the advantages as compared to 180° conduction mode. **(10)**

Q8 Write short answer on any TWO : **(5 x 2)**

a) Single phase bridge inverter

b) SMPS

c) Static VAR Compensator

d) R-C Triggering Circuit