Please check that this question paper contains_____ questions and _____ printed pages within first ten minutes.

[Total No. of Questions: 09]

[Total No. of Pages: 02]

Univ. Roll No.: ....

Program: B.Tech. (Batch 2018 onward)
Semester: 4th

Name of Subject: Power Electronics
Subject Code: PCEE-107
Paper ID: 16188

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

1) Parts A and B are compulsory.
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice.
3) Any missing data may be assumed appropriately.

<div align="center">Part – A</div> [Marks: 02 each]

Q1.

   a) Define holding current and latching current.

   b) State the purpose of freewheeling diode in phase controlled rectifier.

   c) How can the output frequency of a cycloconverter be changed?

   d) Write the applications of phase controlled rectifier.

   e) What is function of gate terminal in a thyristor? When is a gate signal applied and why?

   f) What is the effect of source inductance on converter operation?

<div align="center">Part – B</div> [Marks: 04 each]

Q2. Discuss four quadrants, Type-E chopper.

Q3. Describe Class D commutation technique.

Q4. Write short note on dual converter with circulating current mode.

Q5. A chopper, fed from a 220V dc source, is working at a frequency of 50 Hz and is connected to an R-L load of R=5Ω and L=40mH. Determine the value of duty cycle at which the minimum current will be at 5A.

Q6. An RL Load, energized from single phase, 230V, 50 Hz source through a single thyristor, has R= 10 Ω and L= 0.08H. If thyristor is triggered in every positive half cycle at α= 75°. Find current expression as a function of time.

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Q7. A dc battery is to be charged from a constant dc source of 240V. The dc battery is to be charged from its internal emf of 45 V to 107 V. The battery has internal resistance of 2 Ω. For a constant charging current of 17 A, compute the range of duty cycle.

Part – C [Marks: 12 each]

Q8. Explain various techniques for reduction of harmonics in the inverter output voltage.

OR

Enumerate the various mechanisms by which thyristors can be triggered into conduction.

Q9. A single phase to single phase mid-point cycloconverter is delivering power to resistive load. The frequency ratio is $f_o/f_s = 1/4$. The firing angle delay for all the four SCRs are the same. Sketch the time variations of the following waveforms for $\alpha = 60°$.

a) Supply voltage

b) Output current and supply current.

OR

For a single phase one-pulse SCR controlled converter system, sketch waveforms for load voltage and load current for:

I. RL Load

II. RL Load with freewheeling diode across RL

From a comparison of these waveforms, discuss the advantages of using a freewheeling diode.

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