

Government College of Engineering, Aurangabad
(An Autonomous Institute of Government of Maharashtra)

M. E. (EMD) Revised Examination

End Semester Examination

13.0. NOV 2016

EE 642: MODERN POWER ELECTRONICS

Time: Three Hours

Max Marks: 60

“Verify the course code and check whether you have got the correct question paper”

N.B:-

- 1. Attempt all questions.*
- 2. All questions carry equal marks.*
- 3. Assume suitable data if necessary and state it clearly.*
- 4. Use of programmable calculator is not allowed.*

Q.1 Attempt any two-

- a) How a BJT and Thyristor can be acted as current controlled devices? Prove this concept by its switching characteristics.
- b) Discuss the over voltage and gate protection schemes for IGBT.
- c) Compare a MOSFET and IGBT, with its static and switching characteristics.

Q.2 Attempt any two-

- a) A three phase fully controlled bridge converter is connected to three phase ac supply of 415V supply, having a reactance of 0.3Ω per phase and resistance of 0.05Ω per phase. The converter is working in the inversion mode at a firing advance angle β of 35° . Compute the average generator voltage.
Assume $I_d = 60A$ and thyristor drop = 1.5V.
- b) Explain the operation of a single phase fully controlled converter with inductive load. Draw the waveforms of output dc voltage and current for delay angle of 60° . Also explain the effect of flywheel diode on the performance of the circuit.
- c) Explain the working of a single phase bridge type cycloconverter. Draw the input waveform of frequency f and output waveform of frequency $f/2$ for a resistive load.

Q.3 Attempt any two-

- a) What is cuk regulator? With the help of circuit diagram and associated waveforms discuss the operation of the cuk regulator.
- b) Derive the expression for ripple current of inductor and ripple voltage of capacitor for the buck-boost regulator.
- c) Explain the general steps for the design of chopper circuits.

Q.4 Attempt any two-

- a) Draw the circuit diagram of cascaded type multilevel inverter and discuss its features and operation.
- b) With the help of circuit diagram and necessary waveforms, describe parallel resonant inverters.
- c) Discuss the harmonic reduction techniques used in sinusoidal pulse width modulation type inverters.

Q.5 Attempt any two-

- a) With the help of circuit diagram and necessary waveforms, explain in detail the operation of forward converter used in switched mode DC power supplies.
- b) Discuss the causes of reverse recovery transient voltage.
- c) What is the difference between physical and mathematical thermal equivalent models? Describe mathematical thermal equivalent circuit model.