

B.E.(ECT) EXAMINATION
End Semester Examination Nov. 2016

ET 441: POWER ELECTRONICS

Time: Three Hours

16 NOV 2016

Max Marks: 60

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

N.B.: -

1. Attempt all questions.
2. Figure to the right indicate fill marks.
3. Assume suitable data if necessary and state it clearly.
4. Use of non-programmable calculator and data sheet is allowed.
5. Design will be evaluated on correct diagram and proper component selection.

Q.1. Attempt any five of the following.

(2*5=10)

- a) State the difference between power diode and signal diode.
- b) What losses occur in a thyristor during working conditions?
- c) Define hard-driving or over-driving.
- d) Why circuit turn off time should be greater than the thyristor turn-off time?
- e) Enlist the advantages of six pulse converter?
- f) What is meant by unidirectional or half-wave ac voltage controller
- g) What is meant by sequence control of ac voltage regulators?
- h) Enumerate the applications of cycloconverter.

Q.2. Attempt ant two of the following.

(5*2=10)

- a) With the help of a neat diagram, Explain the two transistor analogy of an SCR.
- b) Explain various types of triggering methods of SCR briefly. Which is the universal method?
- c) Explain functional elements of power electronics system with neat block diagram.
- d) Describe series and parallel operation of SCRs.

Q.3. Attempt ant two of the following.

(5*2=10)

- a) Derive the expression of
 - i. Average Load Voltage,
 - ii. RMS Load Voltage
 - iii. Average load currentfor Single phase half wave controlled converter with R load.
- b) Single phase half wave controlled converter from a 120 V, 50 Hz supply. Load resistance $R= 10\Omega$. If the average output is 40% of the maximum possible average output voltage, Determine Firing angle and Average Output Current

- c) Draw and explain Single phase bridge fully controlled converter with RL load
- d) Explain the effect of inductive load in three phase full wave converter with neat Diagram (M6 Configuration)

Q.4. Attempt ant two of the following.

(5*2=10)

- a) Explain with neat diagram and waveform single phase (Bidirectional) A.C. Voltage Controller with RL load.
- b) Explain Single phase to Single phase step up cycloconverter and state its disadvantages.
- c) Define the term Power Factor. Derive its expression for single phase A.C. voltage regulator feeding a resistive load circuit and show that $PF = [\text{per unit power}]^{0.5}$
- d) Write a short note on SITs.

Q.5. Attempt ant two of the following.

(5*2=10)

- a) With the help of a circuit diagram, explain Class E chopper.
- b) Explain the working principle of step-down chopper and derive expression for Average output voltage.
- c) Explain a single phase full bridge inverter with relevant circuit diagram and waveforms. Assume R load.
- d) A DC Chopper circuit connected to a 120V d.c. source supplies an inductive load having 100mH in series with a resistance of 5Ω . A freewheeling diode is placed across the load. The load current varies between the limit of 10A and 14A. Determine the time ratio of the chopper.

Q.6. Attempt ant two of the following.

(5*2=10)

- a) Write a short note on performance parameter of inverter.
- b) The single phase half bridge inverter has a resistive load of 50Ω and center tap dc input voltage of 96V.
Compute:
 - i. RMS value of output voltage
 - ii. Fundamental component of output voltage waveform
 - iii. First three harmonics of the output voltage waveform
- c) Compare On-line UPS and Off-line UPS.
- d) Draw the torque speed characteristics of the polyphaser induction motor, also explain following operating regions:
 - i. Motoring Region
 - ii. Generating Region
 - iii. Braking Region