

B.E. Electrical (Electronics & Power) Engineering (Model Curriculum) Semester-VII
FE105 / PCC-2 - Advanced Power Converter

P. Pages : 2

Time : Three Hours



GUG/S/25/14246

Max. Marks : 80

-
- Notes :
1. All questions carry equal marks.
 2. Due credit will be given to neatness and adequate dimensions.
 3. Assume suitable data wherever necessary.
 4. Illustrate your answers wherever necessary with the help of neat sketches.
 5. Use of slide rule, Logarithmic tables, Steam tables, Mollier's chart, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted.
 6. Non programmable calculator is permitted.

1. a) Explain boost convert with various loads. 8
b) Describe buck boost converter with various loads. 8

OR

2. a) Describe the classification of chopper in details. 8
b) Design a buck converter to produce an output voltage 18V across a 10Ω load resistor. The output voltage ripple must not exceed 0.5%. The dc supply is 48V, Design for continuous inductor current. Specify the duty ratio, the switching frequency, the values of the inductor and capacitor, the peak voltage rating of each device, and the rms current in the inductor and capacitor. Assume ideal components. 8
3. a) Explain the operation of a three-phase half-controlled bridge rectifier with RLE loads. Sketch the waveforms for $\alpha = 0^\circ$, $\alpha = 90^\circ$, and $\alpha = 120^\circ$. 8
b) Explain the operation of a single-phase half-controlled bridge a.c. to d.c. converter with RLE loads. Derive the expression for average load voltage, average load current, and RMS load voltage. Also, sketch the associated waveforms. 8

OR

4. a) Explain with a neat circuit diagram the basic principle of a dual converter. 8
b) A single-phase semi converter 230V, 1KW heater is connected across 1 phase 230V, 50Hz supply through an SCR. For firing angle delay of 45° and 90° , Calculate the power absorbed in the heater element. 8
5. a) List out the harmonic present at the output waveform of the inverter, state various method for harmonic reduction. 8
b) Write a note on CSI. Give the circuit analysis of the Current Source Inverter with resistive load. 8

OR

6. a) Explain three phase bridge invertors, give its out phase and line voltage waveform. **8**
- b) A single-phase full-bridge inverter may be connected to a load consisting load of (a) RL or RLC overdamped (b) RLC underdamped. For these loads draw the load voltage and load current waveforms under steady operating conditions. Discuss the nature of these waveforms. Also indicate the conduction of various elements of the inverter circuit. **8**
7. a) What is PWM in the case of an inverter? Discuss how the frequency and magnitude of voltage of the inverter can be changed with the help of PWM. **8**
- b) Describe in detail about single-phase VSI sine triangle PWM. **8**

OR

8. a) What is the Space Vector Modulation technique (SVM) and how does it work? **8**
- b) State and explain the methods of voltage control in inverter. **8**
9. a) Give the various configuration of the three-phase ac controller. List the important points of comparison between these circuits. **8**
- b) Explain single-phase to single-phase step-up cycloconverter with the help of mid-point configuration in detail. **8**

OR

10. a) What is an a. c. voltage controller? List some of its industrial applications. Enumerate its merits and demerits. **8**
- b) A single – phase – to single – phase cycloconverter is supplying an inductive load comprising a resistance of 5Ω and an inductance of 40mH from a 230V , 50Hz single-phase supply. It is required to provide an output frequency that is $1/3$ of the input frequency. If the converters are operated as semi converters such that and firing delay angle is 120° . Neglecting the Harmonic content of load voltage, determine: (a) rms value of output voltage. (b) rms current of each thyristor and (c) input power factor. **8**
