

M. Tech. Electrical Power System CBCS Pattern Semester-II
PEPS21 - Advanced Power Electronics

P. Pages : 2

Time : Three Hours



GUG/W/23/11021

Max. Marks : 70

- Notes :
1. All questions carry equal marks.
 2. Answer **any five** questions.
 3. Due credit will be given to neatness and adequate dimensions.
 4. Assume suitable data wherever necessary.
 5. Illustrate your answers wherever necessary with the help of neat sketches.
 6. Use of Mollier's chart, non programmable calculator is permitted.

1. a) Draw the electrical equivalent circuit of a power MOSFET and explain the gate drive consideration of MOSFET. 6
b) A flyback SMPS supplies a load of 40A at 5V. The source voltage is 240V dc and the transformer initial magnetizing current is 0.4A. The power MOSFET is operating at a frequency of 50KHz with a duty cycle of 0.4. Determine the transformer turns ratio from primary to secondary and its inductance. Assume ideal components and no ripple in load voltage. Find also the open circuit voltage across the semiconductor device. 8
2. a) Explain the switching characteristics of IGBT with the help of neat circuit diagram and waveforms. 7
b) Explain the working principle of Buck-Boost converter with appropriate waveform and circuit diagram. 7
3. a) A single – phase bridge rectifier is supplied from a 120V, 50Hz source. The load resistance is $R = 300 \text{ Ohm}$. 7
i) Design C-filter so that the ripple factor of the output voltage is less than 5%.
ii) With the value of capacitor C in part (i), Calculate the average load voltage V_{dc} .
b) What are the purposes of input filters and output filters in rectifier circuits? 7
4. a) An ac-dc converter steps down the voltage through a transformer and supplies the load through a bridge rectifier. Design a 50 Hz. Power transformer of the specification: Primary Voltage $V_1 = 120\text{V}$, 50Hz (square-wave). Secondary voltage $V_0 = 40\text{V}$ and secondary output current $I_0 = 165\text{A}$. Assume transformer efficiency = 95% and window factors $U_k = 0.4$. Use E-core. 10
b) What are the problems of transformer core used for designing converter transformer. 4
5. a) Compare zero voltage resonant inverter with zero current resonant inverter. Also explain two quadrant ZVS converter. 7
b) Explain working of five level diode clamped inverter with necessary circuit diagram and waveforms. 7

6. a) Explain space vector modulation technique used for multilevel inverter. 7
- b) Classify carrier based PWM technique for multilevel inverter. Explain any one in detail. 7
7. a) Give classification of resonant converters. Also give the analysis of basic series resonance circuit. 7
- b) Explain operation parallel load resonant DC to DC converter. 7
8. Write short notes on **any four**. 14
- a) Principle of operation of buck converter.
- b) Operation of resonant DC link inverter.
- c) Multi output operation of isolated converter.
- d) Quasi resonant inverters.
- e) Load commutated inverters.
