Question Paper Code	12368

M.E. / M.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2023
First Semester
M.E.-Power Electronics and Drives
20PPEPC103 - ANALYSIS AND DESIGN OF POWER CONVERTERS
(Regulations 2020)

Duration: 3 Hours Max. Marks: 100

PART - A (10 × 2 = 20 Marks)
Answer ALL Questions

Marks, K-Level, CO

1. What is the inversion mode of converters? — 2,K1,CO1
2. What is meant by the non-circulating mode of operation of a dual converter? — 2,K1,CO1
3. Draw the sketch of Battery Charger? — 2,K1,CO2
4. List any two applications of SMPS. — 2,K1,CO2
5. Mention the soft magnetic materials. — 2,K1,CO3
6. Define the filling factor. — 2,K1,CO3
7. Define the term switching loss. — 2,K1,CO4
8. Draw the high-frequency equivalent circuit of zero- voltage transition PWM converters. — 2,K1,CO4
9. Define On - Off control of AC voltage regulators. — 2,K1,CO5
10. Define matrix converter. — 2,K1,CO5

PART - B (5 × 13 = 65 Marks)
Answer ALL Questions

11. a) Explain the operation of a single phase full bridge converter with R-L load for continuous and discontinuous load current. — 13,K2,CO1

OR

   b) Explain the pulse width modulation technique for power factor improvement. — 13,K2,CO1

12. a) Draw and explain the block diagram of SMPS and mention its advantages over linear power supply. — 13,K2,CO2

OR

   b) Discuss the basic operation of a Flyback converter showing various modes and draw the steady state waveforms of discontinuous mode operation. — 13,K2,CO2

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create **12368**

13. a) Illustrate the optimum flux density unlimited by saturation in transformer design. *13,K2,CO3*

OR

b) Analyze and design of methodology for inductor design. *13,K2,CO3*

14. a) Summarize the basic principles of soft switching and hard switching. *13,K2,CO4*

OR

b) Explain in detail the Zero-Current Transition PWM Converters and sketch the waveforms. *13,K2,CO4*

15. a) (i) Derive the RMS output voltage for a single phase half controlled ac voltage controller with R-load. *7,K2,CO5*
    (ii) Draw the voltage and current waveform with R load and R-L load and justify the shape of the waveform. *6,K2,CO5*

OR

b) Explain with circuit diagram and waveform the principle of phase control of single phase controller with RL load and obtain expression for voltage and power factor. *13,K2,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) Explain the working of SEPIC Converter in detail with necessary waveforms and equations. *15,K2,CO2*

OR

b) Design a transformer single-capacitor phase-controlled series-resonant converter with a transformer center - tapped rectifier. The specifications are $VI = 270$ to 300 V, $Vo = 28$ V, and $RL_{min} = 10\ \Omega$. Assume the resonant frequency $f_0 = 150$ kHz, the inverter efficiency $\eta_I = 94\%$, and the rectifier efficiency $\eta_R = 95\%$. Draw the efficiency of the designed converter η as a function of load resistance RL. *15,K2,CO4*