Reg. No.												

Question Paper Code	21342

M.E. / M.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022
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. Calculate the output voltage for the triggering angle α = 90° in a single phase half controlled converter feeding R load with the supply of 230 V *2,K2,CO1*

2. Recall the waveform for three phase semi converter with R load for α = 30°. *2,K1,CO1*

3. A step up chopper is used to feed a load at 400 V DC from a 250 V DC source. The inductor current is continuous. If the 'off' time of the switch is 20 s, predict the switching frequency of the chopper. *2,K2,CO2*

4. State the difference between isolated and non-isolated converter. *2,K2,CO2*

5. Describe the soft and hard magnetic materials. *2,K2,CO3*

6. Discuss the core loss of inductor design. *2,K2,CO3*

7. Mention some merits of resonant DC-DC converters *2,K1,CO5*

8. What are the advantages of soft switching over hard switching? *2,K1,CO5*

9. A single phase AC voltage controller feeding a pure resistance load has a load voltage of 200 V(rms) when fed from a source of 250 V(rms). Identify the input power factor of the controller. Justify your answer *2,K2,CO4*

10. List some applications of the matrix converter. *2,K1,CO4*

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

11. a) Explain the operation of Dual Converter with complete block diagram and waveforms. *13,K2,CO*

OR

b) (i) Explain the effect of source impedance in the operation of 3 φ full converter. Derive the expression for drop in output voltage *7,K2,CO1*

(ii) A 3φ full converter fed from 220V, 50Hz supply gives an output voltage of 180V at no load. When loaded with constant output current of 10A, the overlap angle is found to be 6°. Compute the value of source inductance. *6,K3,CO1*

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **21342**

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12. a) The buck regulator has an input voltage of 12 V. The required output voltage is 5 V and the peak to peak output ripple voltage is 20 mV. The switching frequency is 25 kHz. If the peak to peak ripple current of inductor is limited to 0.8A, Compute A) Duty cycle B) Filter inductance C) Filter capacitance Derive the formula used from the fundamentals. *13,K3,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*

13. a) Explain the steps involved in the design of inductor used in a buck converter. *13,K2,CO3*

OR

b) With Neat Example explain the selection of input and output filter design for a flyback converter. *13,K2,CO3*

14. a) Explain the different modes of operation of ZVS resonant switch converter with waveform. *13,K2,CO5*

OR

b) Explain with neat diagram , how the soft switching is efficient over the hard switching. *13,K2,CO5*
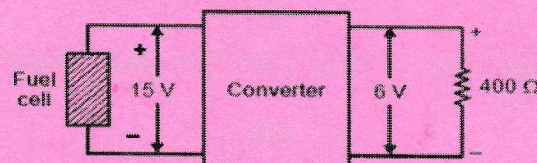
15. a) Illustrate the operation of a three phase AC voltage regulator having six thyristor with neat sketches of voltage waveforms *13,K2,CO4*

OR

b) Explain with a neat diagram the operation of a matrix converter. Draw the relevant waveforms. *13,K2,CO4*

PART - C (1 × 15 = 15 Marks)

16. a) Design and construct a suitable power converter based on the given details *15,K4,CO2*

Switching frequency = 20 kHz
Peak-to-peak ripple current $\Delta I = 0.75$ A
Peak-to-peak ripple voltage $\Delta V = 20$ mV

OR

b) Design and construct a suitable power converter for the following specifications. Converter gets input from solar cells   *15,K4,CO2*

Solar cells output voltage = 12V

Converter output voltage = 24V

Peak to peak output ripple voltage = 20mV

Peak to peak ripple current of inductor = 0.8A

Switching frequency = 25kHz