

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER M. TECH DEGREE EXAMINATION**

**D**

**Electrical & Electronics Engineering**

**(Power Systems)**

**04EE6303—Power Electronics Circuits**

Max. Marks : 60

Duration: 3 Hours

**PART A**

*Answer All Questions*

*Each question carries 3 marks*

1. Explain the function of snubber circuits.
2. What are the advantages of connecting a freewheeling diode across an inductive load.
3. Define the following performance measures, (i) Ripple factor (ii) Input displacement factor and (iii) Input current harmonic factor.
4. What is the effect of chopping frequency in the load circuit on the output ripple current.
5. Draw the Flyback equivalent circuit during  $T_{ON}$  and  $T_{OFF}$ .
6. List out any three applications of SMPS.
7. Define modulation index and frequency modulation ratio.
8. Compare bipolar and unipolar sinusoidal PWM.

**PART B**

*Each question carries 6 marks*

9. List out the similarities and dissimilarities if any between real and ideal switches.  
OR
10. Discuss the static and dynamic performance of IGBTs.
11. With necessary circuit diagrams and waveforms explain the principle of operation of a three phase half wave controlled converter and derive the expression for rms and average output voltage.  
OR
12. A single phase full wave converter delivers power to a load consisting of a resistance in series with a large inductive reactance. A freewheeling diode is connected across the load. Explain its working with the help of relevant waveforms. Derive the expression for the average output voltage and average value of load current.
13. Explain the principle of operation of a three phase ac voltage controller for  $\alpha = 60^\circ$ .  
OR
14. A single phase fully controlled bridge supplies an inductive load. Assuming that the output current is  $I_d$ , determine the following performance measures, if the supply voltage is 230V and if the firing angle is maintained at  $\pi/6$  radians. (i) Average output voltage (ii) Supply RMS current (iii) Supply fundamental RMS current.
15. Explain the working of Cuk regulator with the help of necessary waveforms and obtain the expression for the output voltage.  
OR
16. Design a buck boost regulator with an input voltage of 24V and a duty ratio of 0.4. The switching frequency is 40 kHz. The inductance value is  $100\mu\text{H}$  and the capacitance value is  $220\mu\text{F}$ . The load resistance is  $10\Omega$ . Determine the average output voltage, average maximum and minimum values of inductor current and peak to peak output voltage ripple.
17. Discuss the working of forward converter in detail.

OR

18. Explain the various isolated bridge topologies in detail.
19. Explain the operation of single phase current source inverter with waveforms.

OR

20. Compare the operation of single phase half bridge with a full wave bridge inverter.