

**KADI SARVA VISHWAVIDHYALAYA****ME (Electrical Power System) semester-I External Examination, Jan-2013****Subject- Advanced Power Electronics****Date- 21/01/2013****Max. Marks- 70****Instructions:**

1. Use of scientific calculator is permitted.
2. Attempt sections in separate answersheets.

**Section-I**

- Q.1.(a)** Explain construction of Silicon Controlled Rectifier. [05]  
**(b)** Obtain average DC voltage for single phase controlled rectifier in terms of firing angle. [05]  
**(c)** What happens when current is flowing through the source,  $v_s < E$  and thyristor is triggered? [05]

**OR**

- (c)** Explain volt-current characteristics of SCR.  
**Q.2.(a)** Draw voltage and current equations for different modes of operation in single phase controlled rectifier. [05]  
**(b)** Enlist different commutation methods of SCR. Explain line commutation of thyristor converter. [05]

**OR**

- Q.2.(a)** Draw waveform of input current for single phase fully controlled converter with highly inductive load. [05]  
**(b)** Explain operation of three phase controlled rectifier with inductive load. [05]  
**Q.3.(a)** Classify multi-pulse converter. Explain series twelve pulse converter. [05]  
**(b)** Draw phasor diagrams and winding configuration for Y-Z<sub>1</sub> transformer and derive equations for turns ratio and phase angle. [05]

**OR**

- Q.3.(a)** Why AC voltage controller with inductive load cannot be operated with continuous output current? [05]  
**(b)** Write a short note on Matrix converter operation. [05]

**Section-II**

- Q.4.(a)** Explain topology of single phase full bridge VSI. Write equation of fundamental output voltage. [05]  
**(b)** Draw gating signals for 120 degree mode of operation in VSI. Tabulate phase voltage for each period. [05]  
**(c)** Write a short note on Auto Sequentially Commutated CSI. [05]

**OR**

- (c)** Why capacitive filter is connected at the output side of CSI? [05]  
**Q.5.(a)** Write a short note on third harmonic injected PWM. [05]  
**(b)** Explain topology of boost converter and obtain inductor current equations. [05]

**OR**

- Q.5.(a)** Derive expression for critical inductor value in buck-converter. [05]  
**(b)** Derive expression for dwell time calculation in SVPWM. [05]  
**Q.6.(a)** Explain diode clamped multilevel inverter topology. [05]  
**(b)** Explain Cascaded H-Bridge topology and write switching states of the inverter. [05]

**OR**

- Q.6 (a)** What is redundant switching state in multilevel inverter? Explain with example. [05]  
**(b)** Explain unbalancing of DC link voltage happens in diode clamped inverter. [05]



**KADI SARVA VISHWAVIDHYALAYA****ME (Electrical Power System) semester-I**  
**End Term Examination (ATKT), May-2013****Subject Name- Advanced Power Electronics****Date- 27/05/2013****Time: 10:30 to 1:30 p.m.****Max. Marks- 70****Instructions:**

1. Use of scientific calculator is permitted.
2. Attempt sections in separate answer sheets.
3. All questions are **compulsory**.
4. Indicate **Clearly**, the options you attempt along with its respective question numbers.
5. Use the last page of main supplementary for **rough work**.

**Section-I****Q.1.(a)** Answer in short: [05]

1. Enlist methods of commutation in SCR.
2. Define: Latching current, Holding current, Firing angle, conduction angle (one mark each)

**(b)** Describe V-I characteristics of SCR. [05]**(c)** Describe operation of single phase full wave controlled rectifier with highly inductive load.**OR****(c)** Describe operation of single phase semi controlled converter with highly inductive load.**Q.2.(a)** Explain operation of single phase half wave converter with freewheeling diode. [05]

Draw output voltages for single phase fully controlled converter with firing angle [05]

**(b)** (i)  $45^\circ$  (ii)  $90^\circ$ . Assume continuous current.**OR****Q.2.(a)** Explain operation of three phase full wave rectifier. [05]**(b)** Why SCRs are short circuited during commutation in line commutated thyristor converter? [05]**Q-3(a)** Explain simplified six-pulse converter [05]**(b)** Describe operation of 12-pulse converter. Write any one application of 12-pulse converter. [05]**OR****Q-3(a)** Write short note on : Matrix converter. [05]**(b)** Describe operation of single phase AC voltage regulator. [05]**Section-II****Q.4.(a)** Explain topology of single phase full bridge VSI with inductive load. Write equation of fundamental output voltage with respect to DC link voltage. [05]Explain  $180^\circ$  conduction mode of voltage source inverter. [05]**(b)** Explain sine PWM method of voltage source inverter [05]**OR****(c)** Explain Third harmonic injected PWM of voltage source inverter. [05]**Q.5.(a)** Differentiate between Voltage source inverter and current source inverter. [05]**(b)** Explain Auto Sequentially Commutated Current Source Inverter. [05]**OR**



- Q.5.(a) Draw and explain buck-boost converter topology. What does -ve sign indicate in voltage gain equation? [05]  
(b) Derive expression for minimum and maximum inductor current in buck converter. [05]  
Q-6(a) Explain principle of operation in multilevel inverter. [05]  
(b) Enlist advantages of multilevel inverter. [05]

OR

- Q-6(a) Explain diode clamped multilevel inverter. [05]  
(b) How unbalancing of capacitor occurs in diode clamped multilevel inverter? [05]

-----Best of Luck-----



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Q-6(a) Explain principle of operation in multilevel inverter. [05]

(b) Enlist advantages of multilevel inverter. [05]

OR

Q-6(a) Explain diode clamped multilevel inverter. [05]

(b) How unbalancing of capacitor occurs in diode clamped multilevel inverter? [05]

-----Best of Luck-----