

**APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY  
08 PALAKKAD CLUSTER**



Q. P. Code : PE0819212 - II

(Pages: 4)

Name .....

Reg. No: .....

**SECOND SEMESTER M.TECH. DEGREE EXAMINATION APRIL/MAY 2019**

**Branch: Electrical & Electronics**

**Specialization: Power Electronics**

**08EE 6212 ANALYSIS OF POWER ELECTRONIC CIRCUITS -II**

Time:3 hours

Max.marks: 60

Answer all six questions.

Modules 1 to 6: Part 'a' of each question is compulsory and answer either part 'b' or part 'c' of each question.

(graph sheets can be provided)

**Module 1**

**Marks**

**Q.no.**

- |   |  |   |
|---|--|---|
| a | List the different control methods for inverter and describe the method for judging the superiority of an inverter . | 3 |
|---|--|---|

Answer b or c

- |   |  |   |
|---|--|---|
| b | Describe space vector pulse width modulation technique and compare its performance with Sine PWM                   | 6 |
| c | What is voltage reference modulation technique? Give its major classification and describe them with neat figures. | 6 |

**Marks**

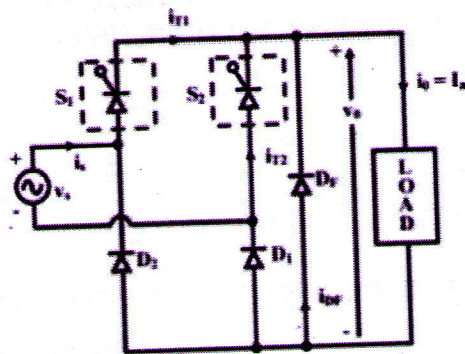
**Module 2**

**Q.no.**

- |     |  |   |
|-----|--|---|
| 2.a | List and describe any two forced commutation methods with its advantages . | 3 |
|-----|--|---|

Answer b or c

b.



The single phase semi converter shown in figure is operated from a 120V, 60Hz supply and uses an extinction angle control. The load current with an average value of  $I_a$  is continuous has negligible ripple content. If extinction angle  $\beta = \pi/3$ , calculate the harmonic factor of input current and the input power factor.

- c (i) Draw the PWM pattern and fundamental modulating voltage of forced commutated voltage source rectifier. (2)
- (ii) Three phase PWM rectifiers can be used for power factor correction. Explain. (4)

6

Q.no.

Module 3

Marks

- 3.a Draw the implementation diagram and PWM waveforms for maximum constant boost control of Z-source inverters. 3

Answer b or c

- b (i) Define z- source inverter and explain its operating modes. (3) 6
- (ii) The selection of capacitors and inductors of a z-source inverter is important. Give reasons. (1)
- (ii) write a note on space vector PWM applied to Z-source inverters. (2)
- c (i) What is the necessity for higher pulse converter circuits? (2) 6
- (ii) Draw the schematic diagram of a 12 pulse converter and prove that its output contains only higher order harmonics. (4)

Q.no.	Module 4	Marks
4.a	List the advantages and application of multilevel inverters. How multilevel inverters can be realized?	3

**Answer b or c**

b	Draw the schematic diagram of a five level single phase flying capacitor type inverter and give its principle of operation . List its main features, advantages and disadvantages.	6
c	(i)With neat figures explain the working of improved five level diode clamped inverter (4) (ii)It is difficult to control the real power flow in diode clamped multi level inverters-justify. (2)	6

Q.no.	Module 5	Marks
5.a	(i) Define 'modulation' in inverters and what is the significance of modulation index and frequency on their performance.?	4

(ii)Draw and explain the block diagram of a current controlled voltage source PWM inverter and mention its advantages over voltage controlled methods. (2)

**Answer b or c**

b	(i)What is a bang bang controller? List its applications. (3) (ii)How modulation in multilevel inverters can be achieved through hysteresis current controllers? List its limitations if any and suggest remedies. (5)	8
c	(i)How open loop current controllers differs from closed loop current controllers? List the major types of closed loop current controllers. (3) (ii) Why constant switching frequency control is preferred in inverters? List and describe methods for achieving constant switching frequency control of multilevel inverters. (5)	8

Q.no.	Module 6	Marks
6.a	Draw the circuit of a three phase to three phase matrix converter and write a note on its control? List its advantages. Why its practical applications are limited?	4

**Answer b or c**

- b** (i) Write a note on modulation strategy of matrix converters? (2) **8**  
(ii) Explain Venturini control method for matrix converters and its impact on power factor of the system.. (6)
- c** (i) Write a note on commutation in matrix converters. (4) **8**  
(ii) Describe power factor of any power electronic system and comment on input power factor of matrix converters . (4)