

Name:.....

Reg.No.....

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

EIGHT SEMESTER B.TECH (HONS.) EXAMINATION MAY 2019



Course Code: 08EE6212

Course Name: ANALYSIS OF POWER ELECTRONIC CIRCUIT II

Time:3 hours

Max.marks: 60

Answer all six questions.

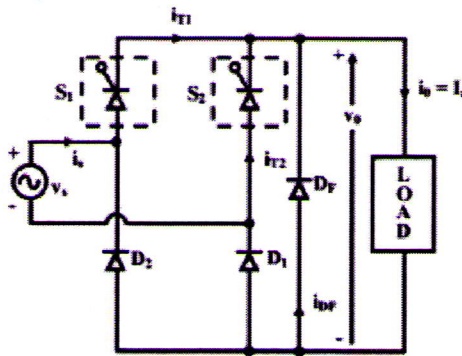
Modules 1 to 6: Part 'a' of each question is compulsory and answer either part 'b' or part 'c' of each question.

(graph sheets can be provided)

| Q.no. | Module 1 | Marks |
|-------|---|-------|
| 1.a | How the superiority of an inverter can be assessed? Describe. | 3 |
| | Answer b or c | |
| b | What is voltage reference modulation technique? Give its major classification and describe them with neat figures. | 6 |
| c | Describe space vector pulse width modulation technique and compare its performance with Sine PWM. | 6 |
| Q.no. | Module 2 | Marks |
| 2.a | What is forced commutation? List its advantages and name any four techniques of forced commutation with its major features. | 3 |
| | Answer b or c | |

b.

6



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. 6
- (ii) Three phase PWM rectifiers can be used for power factor correction. Explain. (2+4)

| Q.no. | Module 3 | Marks |
|-------|--|-------|
| 3.a | Draw the implementation diagram and PWM signals for maximum boost control of Z-source inverters. | 3 |

Answer b or c

- b (i) Describe the operating principle of a z-source inverter. 6
- (ii) The selection of capacitors and inductors of a z-source inverter is important. Give reasons.
- (ii) write a note on space vector PWM applied to Z-source inverters. (3+1+2).
- c (i) What is the necessity for higher pulse converter circuits? 6
- (ii) Draw the schematic diagram of a 12 pulse converter and prove that its output contains only higher order harmonics. (2+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) 6
- (ii) It is difficult to control the real power flow in diode clamped multi level inverters-justify. (2)

| | | |
|--------------|-----------------|--------------|
| Q.no. | Module 5 | Marks |
|--------------|-----------------|--------------|

- 5.a (i) Define 'modulation' in inverters and what is the significance of modulation index? (2) 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? 8
- (ii) How modulation in multilevel inverters can be achieved through hysteresis current controllers? List its limitations if any and suggest remedies. (3+5)
- c (i) How open loop current controllers differs from closed loop current controllers? List the major types of closed loop current controllers. 8
- (ii) Why constant switching frequency control is preferred in inverters? List and describe methods for achieving constant switching frequency control of multilevel inverters. (3+5)

| | | |
|--------------|-----------------|--------------|
| Q.no. | Module 6 | Marks |
|--------------|-----------------|--------------|

- 6.a Draw the circuit of a three phase to three phase matrix converter and how it can be controlled? Give its advantages. Why its practical applications are said to be limited? 4

Answer b or c

- b (i) Write a note on modulation strategy of matrix converters? 8
- (ii) Explain venturini control method for matrix converters.
- (iii) comment on input power factor of matrix converters (2+4+2)
- c (i) Explain the importance of modelling of converters and give a mathematical model of matrix converter. 8
- (ii) Write a note on commutation in matrix converters.
- (iii) comment on input power factor of matrix converters (2+4+2)