



M.E DEGREE EXAMINATIONS: JUNE 2015

(Regulation 2014)

Second Semester

POWER ELECTRONICS AND DRIVES

P14PETE04: Digital Control in Power Electronics

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Arrange the following converters based on their type of order hold in ascending order [K₂]
 A) DC/DC converter B) AC/DC converter C) DC/AC converter
 a) B)A)C) b) B)C)A)
 c) A)B)C) d) A)C)B)

2. [K₃]

Type	Number of poles
A. AC/DC converter with first order load	i. 2 poles
B. AC/DC converter with first order load and integral element	ii. 3 poles
C. DC/AC converter with first order load and integral element	iii. 1 pole

A B C

a) i ii iii
 b) ii i iii
 c) iii i ii
 d) iii ii i

3. Assertion (A): Stability of any type AC/DC converters will not be the same without considering the load and controller. [K₂]
 Reason (R): The different AC/DC converters will not have same sampling interval.
 a) A and R are true but not related b) A and R are true and related
 c) A is true and R is false d) A is false and R is true
4. If frequency is 50Hz ,then list the sampling interval of different converters [K₃]

Type	Sampling interval
A. Six-phase full-wave controlled rectifier	i.10ms
B. Six-phase half-wave controlled rectifier	ii.3.33ms
C. single phase full-wave controlled rectifier	iii.6.67ms

A B C

- a) i ii iii
b) ii iii i
c) ii i ii
d) i iii ii

5. The damping time constant (τ_d) is less than 0.25 time of Time constant (τ) in A) Buck boost converter B) Cuk converter C) multi element resonant converter [K₃]
a) Both A and B are true b) Both A and C are true
c) A is true and B,C are false d) All are true
6. Arrange the following Types of inverter in ascending order based on number of switching devices used. A) multilevel (three level) inverter B) Three phase full bridge VSI C) single phase full bridge inverter [K₂]
a) C)A)B) b) A)B)C)
c) B)A)C) d) C)B)A)
7. The resonant circuit added for soft switching purpose in [K₂]
a) ZVS converter ZCS converter
c) ZT converter Buck boost converter
8. The sampling interval of single phase AC/AC voltage controller with input supply frequency of 50Hz is [K₃]
a) 10ms b) 5ms
c) 6.67ms d) 2.5ms
9. The multi stage PWM inverter have A) firing pulse cycle of 2.5ms if $f=400\text{Hz}$ B) a pole of $1/e$. [K₃]
C) the sampling interval of 2.5ms if $f=400\text{Hz}$.
a) Both A and B are true b) Both A and C are true
c) A is true and B,C are false d) All are true
10. Matrix converter is the development of [K₁]
a) Forced commutated cycloconverter b) Natural commutated cycloconverter
c) AC chopper d) AC/DC converter

PART B (10 x 2 = 20 Marks)

11. Compare stability characteristics in Z plane and S plane. [K₁]
12. What is effect of adding integral element in the converter system? [K₃]
13. What is the equivalent of three phase controlled AC/DC rectifier in digital control? [K₂]
14. Differentiate digitally controlled single phase fully controlled AC/DC rectifier and three phase fully controlled AC/DC rectifier. [K₂]
15. Write the transfer function of PWM inverter in Z domain. [K₁]
16. Draw the block diagram of open loop control of DC/AC converter . [K₂]
17. Write voltage transfer gain for boost, buck and buck-boost converter. [K₁]
18. List the components required to design any DC/DC converter [K₁]
19. What are all the limitations for naturally commutated cycloconverter? [K₁]
20. What is the equivalent of AC/AC converter in Z domain? [K₂]

PART C (6 x 5 = 30 Marks)

21. What is the stability of unit step response of AC/AC converter with first order load? Why? [K₃]
22. Analyze Unit impulse response of any one converter in digital control. [K₄]
23. Explain about the sampling interval of different AC/DC converters and How much is it important in digital control? [K₂]
24. Derive FOH for DC/AC PWM inverter. [K₃]
25. What is the nature of poles in all the four conditions for damping time constant in DC/DC converter? [K₂]
26. Analyze the stability of single phase AC voltage controller. [K₃]

PART D (4 x 10 = 40 Marks)

27. Analyze unit step response of AC/DC converter with first order load and integral element. [K₃]
28. Model three phase Six-phase full-wave controlled AC/DC rectifier in digital control with its operation. [K₃]
29. Model the three phase full bridge PWM voltage source inverter in digital control and also its stability. [K₄]
30. Obtain the digital model of any fundamental converter. And Judge the stability of that converter. [K₄]
