KUMARAGURU college of technology
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Register Number: ……..…

M.E DEGREE EXAMINATIONS: JAN 2015

(Regulation 2014)

First Semester

POWER ELECTRONICS AND DRIVES

P14PET103: Analysis of Power Converters

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. A single phase fully controlled converter delivers a load current of 10A, which is ripple free. Average and RMS currents of the thyristor are [K_3]

   a) 10A, 7.07A b) 5A, 10A

   c) 5A, 7.07A d) 7.07A, 5A

2. In a dual converter if one converter is fired at an angle α the other converter has to be fired at [K_2]

   a) $\pi+\alpha$ b) $\pi-\alpha$

   c) $2\pi+\alpha$ d) $2\pi-\alpha$

3. In a three phase full converter, the six SCR's are fired at an interval of [K_2]

   a) 30° b) 90°

   c) 60° d) 120°

4. The total number of SCR's conducting simultaneously in three phase full converter with overlap considered has the sequence of [K_2]

   a) 3,3,2,2 b) 3,3,3,2

   c) 3,2,3,2 d) 2,2,2,3

5. **Assertion (A):** If the duty cycle of chopper is low the current would not become discontinuous [K_3]

   Reason (R): If the time constant L/R of the load in chopper is low the current may become discontinuous.

   a) Both A and R are correct and R is correct explanation of A b) Both A and R correct but R is not correct explanation of A

   c) A is correct but R is wrong d) A is wrong but R is correct

6. The zero voltage and zero current switching converters is employed for minimizing the [K_2]

a) Turn on loss
b) Turn off loss
c) Conduction loss
d) Both a & b

7. The range of delay angle for three phase AC regulator is [K_2]

a) $0 \leq \alpha \leq 150°$
b) $0 \leq \alpha \leq 180°$
c) $30° \leq \alpha \leq 180°$
d) $30° \leq \alpha \leq 150°$

8. In single phase half wave regulator, the average current over one full cycle [K_4]

a) is always positive
b) may be positive or negative
c) may be negative
d) Is always negative

9. A cyclo converters can be considered to be composed of two converters [K_1]

a) Connected back to back
b) Series connected
c) Parallel connected
d) Series parallel connected

10. Match the following [K_2]

A. Cyclo converter	1. HVDC transmission
B. DC-DC converter	2. Railways
C. AC-DC converter	3. Magnetic amplifiers
D. AC regulator	4. Trolley buses

	A	B	C	D
a)	3	4	2	1
b)	3	1	4	2
c)	4	2	1	3
d)	2	4	1	3

PART B (10 x 2 = 20 Marks)

11. Name the performance parameters of AC-DC converters. [K_1]
12. List out the functions of freewheeling diode in converter circuits? [K_1]
13. Define overlap angle. [K_1]
14. Differentiate circulating and non-circulating current mode of dual converter. [K_2]
15. Name the basic topologies of switched mode regulators. [K_1]
16. Draw the circuit diagram of a four quadrant chopper. [K_2]
17. Name any four applications of ac voltage controllers? [K_1]
18. Justify why are the short duration gate pulses not suitable for single phase ac regulator feeding RL load. [K_3]

19. Define cyclo converter. [K_1]

20. Name the commutation techniques of thyristors used in cyclo converters. [K_1]

PART C (10 x 5 = 50 Marks)

21. Derive en expression for average output voltage, RMS output voltage and displacement factor of a single phase fully controlled converter. [K_2]

22. A single phase semi converter delivers power to RLE load with R=5Ω, L= 10mH and E=80V. For a continuous conduction, find the average value of output current for a firing angle delay of 50° and 230v, 50Hz supply. [K_3]

23. Draw the circuit diagram and output waveforms of three phase full converter for the firing angle of 60°. [K_2]

24. Explain the Time Ratio Control of a DC chopper. [K_2]

25. Draw the various types of zero current switch topologies. [K_2]

26. A DC to DC chopper operates from a 48 V battery source into a resistive load of 240Ω. The frequency of the chopper is set to 250Hz. Determine the load power when on-time of the chopper is 1 ms? [K_3]

27. Draw the possible configurations of single phase voltage controllers and compare them. [K_2]

28. A single-phase full wave controller feeds power to a resistive load of 100 Ω from a 230V, 50Hz supply. Calculate the rms output voltage, input power factor and the half cycle average current at delay angles $\alpha_1=\alpha_2=\alpha=90$ degree of both thyristors. [K_3]

29. Derive the output voltage equation of a cyclo converter. [K_2]

30. Explain the operation of single phase step down cyclo converter. [K_2]

PART D (2 x 10 = 20 Marks)

31. With neat circuit and waveforms explain the working of single-phase dual converter. [K_2]

32. Describe the operation of a three phase three wire AC voltage controller with neat power circuit and waveforms. [K_2]

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