

Menoufiya University
Faculty of Engineering
Shebin El-Kom
First Semester Examination
Academic Year: 2013-2014



Department: Electrical Engineering.
Year: 3rd year.
Subject/Code: Power electronics / ELE 314
Time Allowed: 3 hours
Date: 13 / 1 / 2014

Remarks: No. of pages: 2
Allowed Tables and Charts: (None)

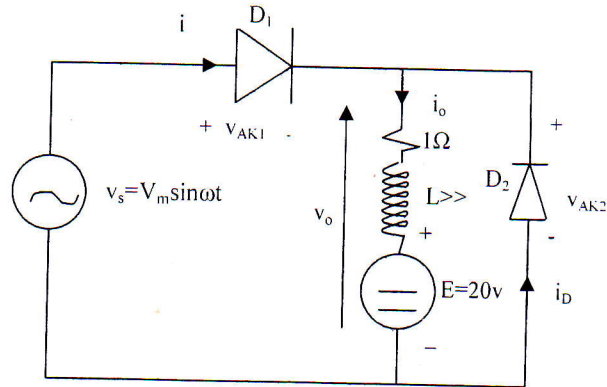
No. of questions: 6

أجب عن خمسة من الأسئلة التالية (100 درجة) [100Mark] Answer five from the following Questions

Question (1) (20Marks)

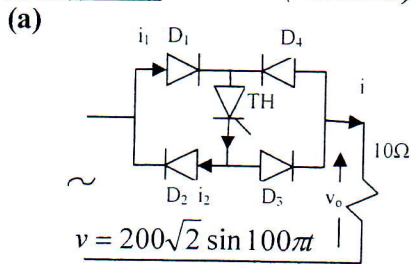
Marks

- (a) What is the meaning of power supply conditioning. [6]
- (b) Define each of the distortion factor and the THD. [6]
- (c) In the circuit shown, $v_s = 160 \sin 314t$. Calculate the power and power factor at the a.c. source. [L is very large so that the output current i_o may be consider smooth] [8]



Question (2) (20Marks)

Marks



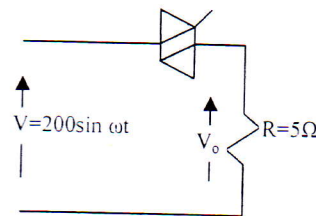
In the circuit shown, the thyristor is phase controlled. At a firing angle of $\pi/4$ do the following:

- a) Sketch the wave-shapes of v , i , v_o , i_1 , i_2 & i_{TH} . [2]
- b) Calculate the rms values of i , v_o , i_1 , i_2 & i_{TH} . [4]
- c) Calculate the load power and the circuit power factor. [4]

- (b) In the circuit shown, the triac is phase-controlled, show that:

$$V_o^2 = V^2 \left[\frac{1}{\pi} (\pi - \alpha + \frac{1}{2} \sin 2\alpha) \right]$$

If phase and integral cycle control combined are applied, then at $T = 10$ cycles, find N and the minimum firing angle α required to adjust the load power at 2.5KW.



Question (3) (20Marks)

Marks

- (a) Sketch the waveform of output voltage, load current, one thyristor current, V_{ak} of one thyristor and supply current for single-phase center tap controlled rectifier fed a highly inductive load at $\alpha = 60^\circ$ in two cases 1) without freewheeling diode 2) with freewheeling diode. [8]
- (b) A single phase bridge rectifier is used to supply a highly inductive load of resistance 12 Ω from a 220 v AC source, at a DC current 12.5 A, find the required firing angle α and the circuit power factor if : [12]
 - 1- The bridge is fully controlled.
 - 2- The bridge is half controlled.

فحص النظر الخلف

Question (4) (20Marks)

Marks
[20]

A three-phase center tap controlled rectifier is used to supply the field winding of a DC motor with constant current 3 A, by controlling the firing angle α against the AC voltage variations. At a phase voltage 220 v, firing angle α was 45° . Find the range of variation of firing angle α if phase voltage variation is between 190 and 240 v. Then find α variation for same phase voltages if a freewheeling diode is connected at the DC motor field terminals.

Question (5) (20Marks)

Marks
[8]

(a) Explain the principle of operation of DC chopper shown in fig (1).

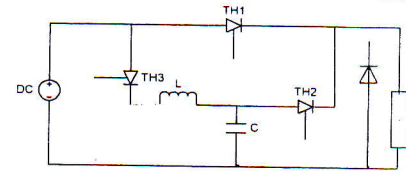


fig. 1

(b) A trolley-bus is driven by a 150 hp, 1500 r/min and 600 v DC series motor as shown in fig 2. The nominal full load current is 200 A and the total resistance of the armature and field is 0.1Ω . the bus is feed from a 700 v DC source. A DC chopper is used to control the motor speed. The chopper frequency varies from 50 Hz to 1600 Hz but on-time period (t_{on}) is fixed at 600μ sec calculate:

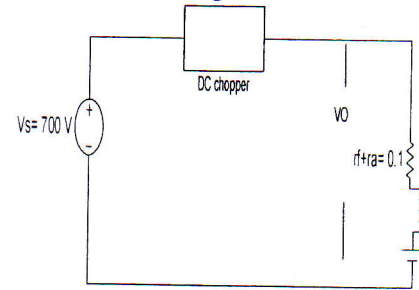


fig. 2

- a) the chopper frequency and the current drawn from DC source when the motor at stand still and drawing 240 A
- b) The chopper frequency when the motor delivers its rated output.

[12]

Question (6) (20Marks)

Marks
[10]

(a) Show with sketch how Synchro-converter operate as a brushless DC drive.

(b) Explain with sketch the principle of operation of half bridge inverter fed inductive load.

[10]

انتهت الأسئلة مع أمنياتنا بالتوفيق

Field	National Academic Reference Standard(NARS)								
	Knowledge & Understanding				Intellectual Skills	Professional Skills			General Skills
Course ILOs	a-4-1	a-8-1	a-8-2	a19-1	b13-1	c13-1	c13-2	c17-1	D6-1
Question No.	1-b, 1-c, 3-a,	1-a, 5-b, 6-b,	2-a, 2-b, 5-b	2-a,5-b	2-a,4	2-b, 5-a,6-b,4	2-a, 2-b, 6-a	5-b	5-b