MENOUFIYA UNIVERSITY
FACULTY OF ENGINEERING
DEPLOMA EXAMINATION
CODE NUMBER: ELE520
DATE: 20/1/2014

DEPARTEMENT:ELECTRICAL
SUBJECT: ENERGY CONVERSION BY SEMICONDUCTOR DEVICES
TIME ALLOWED : 3-HOURS
TOTAL MARKS : 100 .

Attempt all questions:

QUESTION(1) (20 MARKS)

[1]A)For the circuit of Figure(1) ,the circuit data is as follows:
R=10 Ω , L=1 mH , C=5μF ,V_S=230Volt
The circuit is initially relaxed. With switch closed at t=0 , determine (i)current i(t) (ii)conduction time of diode(iii)rate of change of current at t = 0.

(B) The circuit of Figure(2) employing resonant pulse commutation (calass-B commutation) has C=20 μF and L=5 μH . Initial voltage across capacitor is V_S=230V. For a constant load current of 300 A . Calculate (i)conduction time for the auxiliary thyristor (ii)voltage across the main thyristor when it gets commutated and(iii)the circuit turn-off time for the main thyristor.

QUESTION(2) (20MARKS)

[2]A) A three – phase full converter charges a battery from a three-phase supply of 230 volt , 50 Hz . The battery emf is 200 volt and its internal resistance is 0.5 Ω . On account of inductance connected in series with the battery , charging current is constant at 20 Ampere . Compute the firing angle delay and the supply power factor.

B) A single – phase full converter feeds power to RLE load with R=6Ω , L=6mH and E=60V. The AC source voltage is 230V , 50Hz . For continuous conduction, find the average value of load current for a firing angle delay of 50 °.
In case one of the four SCRs gets open circuited due to a fault , find the new value of average load current taking the output current as continuous . Sketch waveform for the new output voltage and indicate the conduction of various SCRs.

QUEST ON(3) (20MARKS)

[3]A) (i)Mention the industrial applications for the use of controllable dc power.
(ii)Discuss the classification of the various chopper configurations.

B)A single –phase semi converter, using two thyristors and two diodes as shown in Figure(3) , is supplied from 230 V , 50 Hz source . The load consists of R =10Ω, E=100V and a large inductance so as to render the load current level. For a firing delay angle of 30° , determine (i) average output voltage (ii)average output current (iii)average and rms values of thristor currents (iv)average and rms values of diode currents (v)input power factor and (vi) circuit turn-off time.

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QUESTION(4) **(20 MARKS)**

[4]A)(i)What are the operation principles of single-phase voltage source inverters?
(ii)What are the various control strategies for varying chopper duty cycle α ?

B)For type – A chopper , source voltage V_S is equal to 220 V , chopping frequency f=500 Hz ,and T_{On}= 800μ sec.,R=1Ω ,L=1mH and E=72 V.
(i)Find whether load current is continuous or not. (ii)Calculate the values of average output voltage and current.(iii)Compute the maximum and minimum values of steady – state output current.(iv)Sketch the time variations of gate signal i_g, load current i_o, load voltage v_o, thyristor current i_T , freewheeling diode current i_{fd} and voltage across v_T.

QUESTION(5) **(20 MARKS)**

(A)A single-phase bridge inverter delivers power to a series connected RLC Load R=2Ω , ωL=10Ω .The periodic time T=0.1 m.sec. What value of C should the load have in order to obtain load commutation for SCRs . The thyristor turn-off is 10 μsec. Take circuit turn off time as 1.5 t_q. Assume that load current contains only fundamental component.

B)A three – phase bridge inverter delivers power to a resistive load from a 450 V dc source For a star-connected load of 10Ω per phase ,determine for 120°mode operation: (i)rms value of load current. (ii)rms value of thyristor current. (iii)load power.

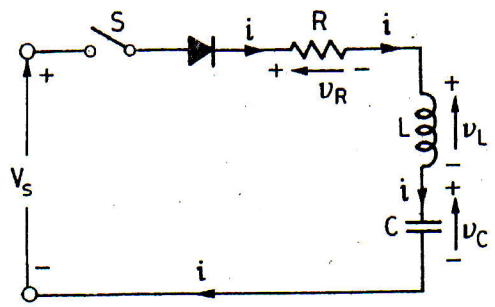
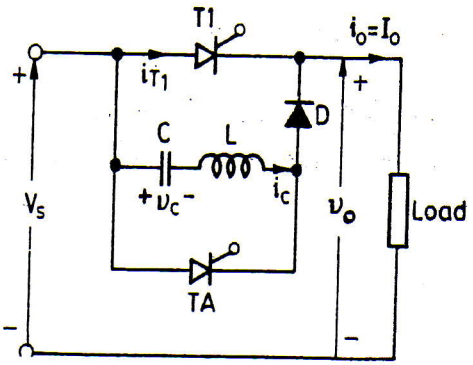
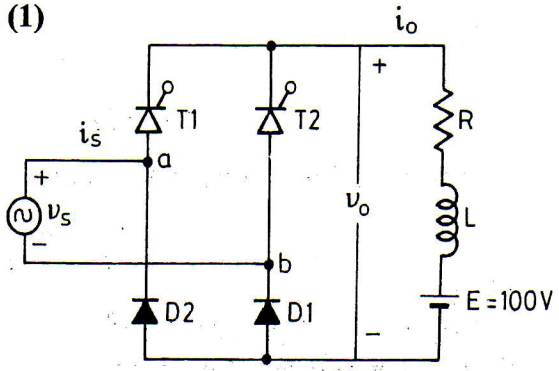


Figure (1)



Figure(2)



Figure(3)

Field	National Academic Referencee Standard (NARS)			
	Knowledge and Understanding	Intellectual Skills	Professional Skills	General Skills
Program Academic Standards That The Course Contribute in Achieving	A1,A2	B1,B2	C1	D2,D4
Question Number	Q1,Q2,Q3,Q4,Q5	Q2,Q3,Q4	Q2,Q3,Q4	Q2,Q3,Q4,Q5

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