



SE-8277

B. E. III (Sem. V) (Elect.) Examination

May / June - 2011

Power Electronics - I

(New Course)

Time : Hours]

[Total Marks :

Instructions :

(1)

नीचे दशांशिक निशानीवाणी विगतो उत्तरवही पर अवश्य लपनी.  
 Fillup strictly the details of signs on your answer book.

Name of the Examination :  
 B. E. 3 (Sem. 5) (Elect.)

Name of the Subject :  
 Power Electronics - I (New)

Subject Code No. : 8 2 7 7 Section No. (1, 2,.....): Nil

Seat No. :

Student's Signature

- (2) Attempt all questions.
- (3) Make suitable assumptions, where ever necessary.
- (4) Figures to the right side indicate full amrks.

<b>Q-1 (a) Fill in the blanks.</b>	<b>10</b>
1 MOSFET is _____ device whereas BJT is a bipolar device.	1
2 Snubber circuit is a very useful to limit _____ across thyristor.	1
3 _____ power switches has combines advantages of MOSFET & BJT.	1
4 The use of freewheeling diode improves the _____ & _____.	2
5 Triac is _____ thyristor.	1
6 Dual converter can be _____ or _____.	2
7 In a thyristor holding current is _____ than latching current	1
8 The most commonly used method for triggering an SCR is _____.	1
(c) .What is thyristor? Discuss its operation.	5
(d) What is meant by commutation of SCR? How is commutation methods classified?	5
<b>Q-2 (a) A single phase full converter bridge is connected to RLE load .The source Voltage is 230 V, 50 Hz. The Average load of 10 A is continuous over the working range for R=0.4Ω &amp; L= 2 mH. Compute</b>	<b>8</b>
(a) Firing angle delay for E = 120V	
(b) Firing angle delay for E = -120V	
And indicate which source delivers power to load in parts of (a) & (b).	
(c) In case o/p current assumed constant, find the i/p power factor for both parts (a) & (b).	
(b) Draw circuit and explain the single phase semi converter.	7
<b>OR</b>	
<b>Q-2 (a) Draw the circuit of a single phase half wave controlled rectifier feeding a R-L load. Derive expression for various performance indices.</b>	<b>7</b>
(b) Draw the circuit diagram of three phase dual converter and explain its working.	8

Q-3

Attempt any three.

- 1 Write a brief note on principle of operation and characteristics of Power MOSFET.
- 2 What is effect of source inductance on operation of single phase controlled rectifier?
- 3 Explain synchronized UJT triggering with circuit diagram & wave forms.
- 4 Explain various voltage and current ratings of thyristor.
- 5 Write a brief note on internal structure and principle of operation of diac.

4 (a) Answer the following questions : 10

- (1) Draw fig. of current commutated chopper.
- (2) Disadvantages of voltage commutated chopper.
- (3) Advantages and disadvantages of buck regulator.
- (4) Applications of SMPS.
- (5) Draw block diagram of converter fed dc motor drive.

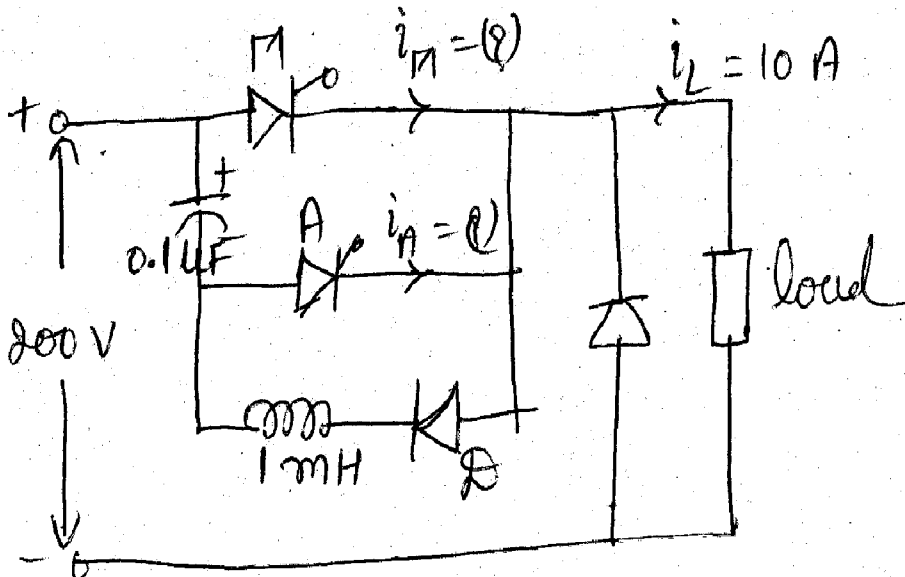
(b) A dc series motor is fed from 600V dc source 6  
through a chopper. The dc motor has the following parameters.

$$r_a = 0.04\Omega, r_s = 0.06\Omega, k = 4 \times 10^{-3} \text{ Nm / amp}^2.$$

The average armature current of 300 A is ripple free for a chopper duty cycle of 60%, Determine.

- (a) input power from the source
- (b) Motor speed
- (c) Motor torque

(c) A voltage commutated chopper circuit, operates 4  
at 500 Hz, is shown below. If the maximum value of load current is 10 A, then find  $i_M$  and  $i_A$ .



- 5 (a) Explain principle and operation of class C chopper. **6**  
 (b) A semiconverter operated from 1- $\phi$ , 230V, 50 Hz **6**  
 supply drives a 10 hp, 200 V, 1500 rpm, separately  
 excited dc motor. The rated armature current is 40 A.  
 The motor parameters are  $r_a = 0.5 \Omega$ ,  $L_a = 10$  mH,  
 $K_a \phi = 0.2$  V/rpm. find out the following at  $\alpha = 30^\circ$ .  
 (1) Average armature current  
 (2) Back emf of motor  
 (3) Speed of the motor

**OR**

- 5 (a) Explain 1- $\phi$  semi -converter drive. **6**  
 (b) For type - A chopper, source voltage. **6**  
 $V_s = 220$  V, chopping freq.  $f = 500$  Hz,  $T_m = 800 \mu s$ ,  
 $R = 1 \Omega$ ,  $L = 1$  mH and  $E = 72$  V.  
 (i) Find whether load current is continuous or not.  
 (ii) Calculate the values of average output voltage.

- 6 Attempt any **three** : **18**  
 (1) Explain boost regulator.  
 (2) 1 -  $\phi$  half wave converter drive.  
 (3) Explain principle of rheostatic brake control.  
 (4) Compare the linear and s/w mode and resonant power  
 supply.  
 (5) The chopper used for on - off control of a dc  
 separately - excited motor has supply voltage of 230 V  
 dc, an on - time of 10 msec and off - time of 15 msec.  
 Neglecting armature inductance and assume continuous  
 conduction of motor current, calculate the average load  
 current when  $M = 1500$  rpm and  $K_u = 0.5$  V/rad per  
 sec. The  $r_q = 3 \Omega$ .