

**AMIETE – ET (OLD SCHEME)**

Code: AE26

Subject: POWER ELECTRONICS

Time: 3 Hours

**JUNE 2010**

Max. Marks: 100

**NOTE: There are 9 Questions in all.**

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

**Q.1 Choose the correct or the best alternative in the following: (2×10)**

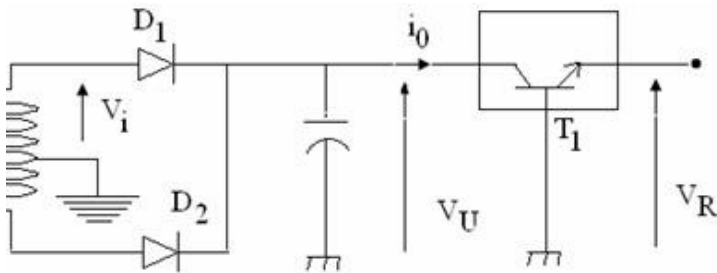
a. The following power device switch requires a continuous signal to turn the switch on

- (A) GTO (B) Thyristor  
(C) IGBT (D) none of the above

b. In a three phase six pulse rectifier, each diode conducts for

- (A)  $120^\circ$  (B)  $90^\circ$   
(C)  $60^\circ$  (D)  $150^\circ$

c. The following Fig.1 represents

**Fig.1**

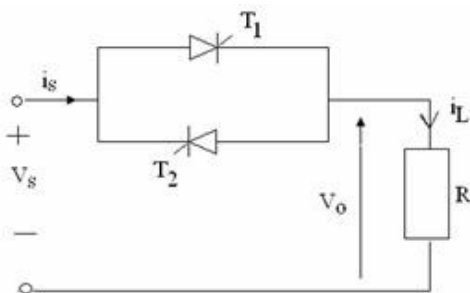
- (A) an SMPS (B) a linear regulated power supply  
(C) a buck converter (D) a CuK converter
- d. Fall in 4% of supply voltage, the torque of an induction motor will be decreased by.
- (A) 2% (B) 8%  
(C) 16% (D) 4%
- e. A resistor connected across gate and cathode of an SCR, increases its
- (A)  $dv/dt$  rating  
(B) holding current.  
(C) noise immunity  
(D) all of these
- f. Over current protection is provided by use of

- (A) saturable  $di/dt$                       (B) snubber circuit  
 (C) circuit breaker and fuse              (D) heat sink
- g. For UJT,  $\eta$  has the values  
 (A) between 0.5 and 0.8                  (B) 0.5  
 (C) not defined                              (D) any value.
- h. Three phase full wave a.c. regulator uses  
 (A) three diodes                              (B) three thyristors  
 (C) three diodes , three thyristors      (D) six thyristors
- i. A type-A chopper requires always  
 (A) forced commutation                  (B) natural commutation  
 (C) impulse commutation                (D) line commutation
- j. Among the following provide less harmonic in output  
 (A) single PWM                              (B) multi PWM  
 (C) multi-pulse PWM                      (D) six-pulse PWM

**Answer any FIVE Questions out of EIGHT Questions.  
 Each question carries 16 marks.**

- Q.2** a. Draw thyristor circuit and explain the V-I characteristics of the SCR. Also, discuss significance of latching current and holding current.                      (10)
- b. Compare the salient features of power transistors and thyristors.                      (6)
- Q.3** a. Differentiate between natural commutation and forced commutation by giving example of each.                      (6)
- b. Describe the principle of resonant pulse commutation and obtain the expression for the circuit turn off time.                      (10)

**Q.4**



**Fig. 2**

A single phase full-wave ac regulator is shown in Fig.2, has a resistive load of  $R=10$  ohms and the input voltage is  $V_s=120$  V (rms), 60 Hz. The delay angle of thyristors are  $\alpha_1 = \alpha_2 = \alpha = \pi$ . Determine                      (8)

- (i) the rms output voltage  $V_o$ ,
- (ii) the input power factor (PF),
- (iii) the average current of thyristors,
- (iv) the rms current of thyristors.

b. Give the circuit and describe the operation of a three phase inverter with 180 degree conduction for star connected resistive load. **(8)**

**Q.5** a. Enlist the commonly used techniques for voltage control of a single phase inverter. Explain the single pulse-width modulation method. **(8)**

b. Explain single-phase semi converter and single phase full-converter drives. **(8)**

**Q.6** a. What is cycloconverter? With waveforms, explain the operation of single phase cycloconverter. **(8)**

b. Draw and explain torque- speed characteristics of induction motor. **(8)**

**Q.7** a. Give the circuit arrangement of a buck-boost regulator and explain its operation with necessary waveforms. **(8)**

b. Explain the working of three phase to three phase cycloconverter. **(8)**

**Q.8** a. Explain single-phase full converter circuit with RL load with waveforms. Also, derive equation to find average output voltage. **(8)**

b. With a neat schematic diagram describe the speed control of a d.c. drive using micro computer control. **(8)**

**Q.9** a. Write short note on any **TWO** of the following: **(10)**

- (i) single phase inverter
- (ii) cycloconverter with intergroup reactor
- (iii) IGBT

b. Explain the operation of a three phase full-wave a.c. voltage controller with resistive load. **(6)**