

**AMIETE – ET (New Scheme)**

Time: 3 Hours

**JUNE 2016**

Max. Marks: 100

**PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.**

**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.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.**
- **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. RC snubber circuit is used to limit rate of
 

(A) rise of current in SCR	(B) rise of voltage across SCR
(C) conduction period	(D) all of these
- b. In an SCR holding current is
 

(A) equal to latching current	(B) less than latching current
(C) more than latching current	(D) not related to latching current
- c. Turn-on time of SCR in series with RL circuit can be reduced by
 

(A) Increasing circuit resistance R	(B) Decreasing R
(C) Increasing circuit inductance L	(D) Decreasing L
- d. The ripple content of load current of a converter feeding RL load is decided by
 

(A) load resistance alone	(B) load inductance alone
(C) both load resistance and inductance	(D) none of these
- e. The advantage of 180° conduction mode of three phase VSI over 120° conduction mode is that
 

(A) it needs less no. of switches	(B) there is no paralleling of switches
(C) the devices in series are not simultaneously switched	(D) the load terminal are not left open during switching
- f. For continuous conduction each thyristor pair of a two pulse full converter should conduct for
 

(A) $\pi$	(B) $\pi-\alpha$
(C) $\pi+\alpha$	(D) $\alpha$
- g. A CSI is normally employed
 

(A) if the source inductance is small	(B) if the source inductance is large
(C) if the load pure inductive load	(D) on any source irrespective of its impedance

- h. The output voltage of a two quadrant chopper designed for operation in I and IV quadrants,  
 (A) varies from  $+V_d$  to  $-V_d$  (B) varies from 0 to  $+V_d$   
 (C) varies from 0 to  $-V_d$  (D) varies from 0 to  $0.5V_d$
- i. The softness factor for soft-recovery and fast recovery diodes are respectively  
 (A) 1 and  $>1$  (B)  $<1$  and 1  
 (C) 1 and 1 (D) 1 and  $<1$
- j. SMPSs are superior to linear power supplies in respect of  
 (A) size and efficiency (B) efficiency and regulation  
 (C) regulation and noise (D) noise and cost

**Answer any FIVE Questions out of EIGHT Questions.**

**Each question carries 16 marks.**

- Q.2** a. Explain Reverse Recovery Characteristics of a Power Diode. Compare power MOSFET with BJT. (4+4)
- b. Derive the approximate and exact equivalent circuits of an IGBT. Analyze the 'latch up' for IGBT. (5+3)
- Q.3** a. Explain the two transistor model of the thyristor. Explain RC firing circuit with suitable circuit diagram and waveforms. (5+5)
- b. Explain the complementary commutation method with relevant waveforms employed for thyristor circuits. (6)
- Q.4** a. Explain the effect of source inductance on the performance of 1-  $\Phi$  full bridge rectifiers. (6)
- b. Describe the working principle of single-phase half controlled bridge rectifier for RL load with a neat sketch. (5)
- c. A single-phase half wave controlled rectifier is fed from 400V, 3-phase mains supply. The load resistance is  $10\Omega$ . If the average value of load voltage is 25% of maximum possible output voltage. Find  
 (i) Firing angle (ii) rms and average output current. (5)
- Q.5** Draw the circuit diagram of a 3-phase half wave thyristor converter feeding R load. Explain its working with the help of neat waveforms and expression of load voltage, load current and source voltage for a firing angle of  
 (i)  $0 < \alpha < 30^\circ$  (ii)  $\alpha > 30^\circ$  (4+6+6)
- Q.6** a. Explain the principle of step down chopper with relevant circuit diagram and waveforms. (8)
- b. A step up chopper has a supply voltage of 220V while output voltage 660V. If the conducting period of chopper is  $100\mu\text{sec}$ . Determine:  
 (i) pulse width of the output voltage  
 (ii) If the pulse width is reduced to 1/2 for the constant frequency operation, find the output voltage. (8)
- Q.7** a. Explain with relevant circuit diagram and waveforms for 3-phase VSI inverter for  $180^\circ$  and  $120^\circ$  conduction mode. (10)
- b. Explain with relevant circuit diagram and waveforms pulse width modulation control. (6)

- Q.8** a. Explain with relevant circuit diagram and waveforms for 1-phase voltage controller. (8)
- b. A single phase bridge type cycloconverter has input voltage of 230V, 50Hz and load of  $R=10$  ohm. Output frequency is one third of input frequency. For a firing angle of  $30^\circ$ , calculate:  
(i) rms value of output voltage (ii) rms current of each converter (8)
- Q.9** a. Write a short note on:  
(i) UPS (ii) Static VAR Controller (SVC) (10)
- b. Explain the operation and working of a Flyback SMPS with the help of a block diagram. (6)