

AMIETE – ET (New Scheme)

Time: 3 Hours

JUNE 2017

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. Schottky diode has a cut in voltage
- (A) less than a p-n junction diode (B) more than a p-n junction diode
(C) equal to a p-n junction diode (D) cannot decide without rating.
- b. Commutation of SCR means
- (A) to bring SCR from conduction state to reverse blocking state
(B) to bring SCR from conduction state to forward blocking state
(C) to bring SCR from OFF state to forward blocking state
(D) to bring SCR from OFF state to reverse blocking state
- c. A 1- \emptyset fully controlled bridge rectifier with AC source voltage of 230V feeds a load consisting of R, L and emf E for continuous conduction mode . If R= 0.1 Ω , rated current= 25A and E= 120 V, firing angle α will be
- (A) 53.7° (B) 124.6 °
(C) 36.3° (D) 55.4 °
- d. A converter which operates in both 3-pulse and 6-pulse modes is
- (A) 1- \emptyset full converter (B) 3- \emptyset full converter
(C) 3- \emptyset semi converter (D) 3- \emptyset half-wave converter
- e. In DC choppers, the waveforms for input and output voltages are respectively
- (A) both discontinuous (B) both continuous
(C) continuous, discontinuous (D) discontinuous, continuous

- f. In a CSI, if the frequency of output voltage is f Hz, then frequency of voltage input to CSI is
 (A) $f/2$ (B) $2f$
 (C) $3f$ (D) f
- g. A circuit which steps up the frequency without change in voltage using one stage conversion is a
 (A) step up chopper (B) Static circuit breaker
 (C) HVDC (D) cycloconverter
- h. The amount of heat produced in a job by the induction heating depends on the
 (A) supply frequency (B) characteristics of job material
 (C) flux coupled by primary coil (D) All of these
- i. The function of SVC is to
 (A) minimize voltage fluctuations (B) improve supply power factor
 (C) Both (A) and (B) (D) None of these
- j. In HVDC transmission lines, high power SCR are used as
 (A) inverters (B) voltage boosters
 (C) converter (D) Both (A) and (C)

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

- Q.2** a. Explain power losses in real switches. (4)
 b. Compare Power MOSFET and IGBT for various aspects in tabular form. (4)
 c. Describe switching performance of a Power Bipolar Junction Transistor. (8)
- Q.3** a. Explain the following w.r.t. thyristor: - (6)
 (i) Holding current (ii) Latching current (iii) Gate current
 (iv) PIV rating (v) turn – on time (vi) On - state voltage.
- b. Discuss dv/dt and di/dt protection for thyristor. (6)
- c. Draw the symbol and V-I Characteristics of the following : (4)
 (i) LASCR
 (ii) GTO

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- Q.4** a. Derive an expression for the (i) average load voltage (ii) RMS load voltage and (iii) average load current; for the 1- \emptyset half wave controlled rectifier with RL load. (9)
- b. Describe operation of an ideal dual converter. (7)
- Q.5** a. Draw the circuit diagram of a 3- \emptyset full controlled bridge rectifier with resistive load. Explain its working with necessary waveforms for $\alpha = 60^\circ$. (10)
- b. Why three phase controlled rectifier is preferred? Enlist various circuit configuration for the same. (6)
- Q.6** a. Discuss working of step-up chopper with neat circuit diagram and waveform. (8)
- b. What is a DC Chopper? State its disadvantages. (4)
- c. A dc chopper remains ON for 30 μ sec and OFF for 10 μ sec. Determine (i) the duty cycle and (ii) the chopper frequency. (4)
- Q.7** a. With a neat circuit diagram and wave forms explain the operation of 1- \emptyset full bridge inverter. (8)
- b. Explain performance of pulse width modulated inverter in detail. (8)
- Q.8** a. A 1- \emptyset half- wave ac voltage controller feeds to a resistive load of 6 Ω from 230 V, 50 Hz source. The firing angle of SCR is 90°. Calculate (i) RMS value of output voltage (ii) RMS value of load current (iii) value of load power. (iv) Draw the Circuit diagram of 1- \emptyset half- wave ac voltage controller. (8)
- b. What is a static switch? List any four advantages of static switch over mechanical switch. Draw schematic of solid state relay using a power device. (8)
- Q.9** Write detailed notes on: (2x8)
- (i) Battery charger (ii) Induction heating