

DipIETE – ET (Current & 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. When a pn junction is forward biased, _____
 (A) electrons in the n-region are injected into the p-region.
 (B) holes in the p-region are injected into the n-region.
 (C) both (A) & (B)
 (D) none of these
- b. Avalanche breakdown in a crystal diode occurs when _____
 (A) Potential barrier is reduced to zero.
 (B) Forward current exceeds a certain value.
 (C) Reverse bias exceeds a certain value.
 (D) All of these.
- c. The emitter of a transmitter is doped _____
 (A) heavily (B) lightly
 (C) moderately (D) none of these
- d. An FET is essentially a _____
 (A) current driven device (B) voltage driven device
 (C) power driven device (D) none of these
- e. An SCR is not made of Ge because _____
 (A) it is not easily available. (B) it has poor conducting properties.
 (C) it has more leakage current. (D) it is costlier to silicon.
- f. A single-phase full wave fully controlled bridge rectifier uses _____
 (A) 4 SCRs (B) 6 SCRs
 (C) 2 SCRs (D) 3 SCRs
- g. Cycloconverter drives are generally employed in _____
 (A) traction (B) mining
 (C) generating low frequency (D) generating pulses
- h. Duty cycle of a chopper is independent of _____
 (A) T_{on} period (B) T_{off} period
 (C) input dc supply (D) none of these

Code: DE71/DE110

Subject: POWER ELECTRONICS

- i. A 3-phase current source inverter can be operated in _____
 (A) 120° mode (B) 30° mode
 (C) 60° mode (D) 90° mode
- j. A Pulse Width Modulation Switching Scheme is used in Single-Phase inverters to _____
 (A) reduce the total harmonic distortion with modest filtering.
 (B) minimize the load on the dc side.
 (C) increase the life of the batteries.
 (D) reduce low-order harmonics and increase high-order harmonics.

Answer any FIVE Questions out of EIGHT Questions.

Each question carries 16 marks.

- Q.2** a. What is power electronics? Explain its applications in industry. (8)
 b. How are power diodes classified? Give the main features of each type. (8)
- Q.3** a. Explain the working of an SCR with the help of two transistor analogy. (8)
 b. In context of an SCR, explain the following:
 (i) PIV (ii) Holding Current
 (iii) Latching Current (iv) $\frac{di}{dt}$ rating (8)
- Q.4** a. Explain with the help of a circuit diagram & waveforms, the working principle of a single phase full wave controlled center-tap rectifier using two SCRs and resistive load. (9)
 b. Differentiate between controlled and uncontrolled rectifiers. (7)
- Q.5** a. Draw the circuit of a three phase full wave half controlled bridge rectifier with resistive load and explain its working and applications. (10)
 b. A three-pulse uncontrolled rectifier is connected to a 3 ϕ , 4-wire, 220V AC source. If the load resistance is 20 Ω , find
 (i) the maximum load voltage (ii) the average load voltage
 (iii) the maximum load current (6)
- Q.6** a. What is a chopper? Explain the differences between step up and step down chopper with the help of suitable diagrams. (10)
 b. A step down De chopper remains ON for 30 μ sec and OFF for 10 μ sec. Determine its
 (i) Duty cycle (ii) Chopper frequency (6)
- Q.7** a. What is a cycloconverter? Give its principle advantages & disadvantages. (8)
 b. Differentiate between static and mechanical switches. Explain briefly static VAR. (8)
- Q.8** a. What is an inverter? Explain the differences between Voltage Source Inverter and Current Source inverter. (10)
 b. A series inverter has $R = 80\Omega$, $L = 8\text{mH}$ and $C = 1.2\mu\text{F}$. Check whether the circuit will work as a series inverter. Find the maximum output frequency. (6)
- Q.9** a. What is power MOSFET? Explain its principle of operation with help of diagram. (8)
 b. Draw the V-I characteristics of a Power BJT and explain. (8)