

**B.TECH. SEM -IV ELECTRICAL 2014 COURSE (CBCS) :
SUMMER - 2018**

SUBJECT : POWER ELECTRONICS

Day : **Saturday**
Date : **02/06/2018**

S-2018-2286

Time : **10.00 AM TO 01.00 PM**
Max. Marks : 60

N.B.

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non-programmable calculator is allowed.

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- Q.1** a) Compute the peak inverse voltage of thyristor connected in the three phase six pulse bridge circuit having input voltage of 415V. voltage safety factor is 2.1 (05)
- b) Draw the gate characteristics of an SCR and explain it. (05)
- OR**
- a) What are dv/dt and di/dt ratings of SCR? What happens if these ratings are exceeded? Explain. (05)
- b) Draw the turn-off characteristic of an SCR and explain the mechanism of turn-off. (05)
- Q.2** Derive an expression for the : (10)
- (i) Average load voltage (ii) RMS load voltage (iii) Average load current (iv) RMS load current for single phase half-controlled convertor with resistive load and inductive load.
- OR**
- Derive the expression for the following performance factors of single-phase fully controlled bridge converter. (10)
- (i) Input displacement factor (ii) Input harmonic factor (iii) Input power factor (iv) voltage ripple factor (v) DC voltage ratio.
- Q.3** a) List the advantages and disadvantages of TRIAC over SCR. (05)
- b) Explain the various triggering modes of a TRIAC. Compare their sensitivity. (05)
- OR**
- a) Explain with the help of neat circuit diagram how DIAC is used as a triggering agent for a TRIAC. (05)
- b) Draw the V-I characteristics of DIAC. Explain the term break over voltage of a DIAC. (05)
- Q.4** a) Draw and explain the operation of cross-sectional structure of power MOSFET. (05)
- b) Draw and explain the switching characteristics of MCT. (05)
- OR**
- a) With the help of neat structural diagram and suitable waveform, explain the operation of IGBT. (05)
- b) Draw a schematic diagram of off-line UPS and its operation. Also list the specification of off-line URS. (05)

P.T.O.

Q.5 A D.C. chopper circuit connected to a 100 V dc source supplies an inductive load having 50 mH in series with a resistance of 10Ω . A freewheeling diode is placed across the load. The load current varies between the limit of 10A and 12 A. Determine the time ratio of the Chopper. **(10)**

OR

A step-down chopper has a resistive load of $R = 20\Omega$ and input voltage $E_{dc} = 250V$. When the chopper remains ON, its voltage drops is 3.5V. The chopper frequency is 2kHz. If the duty cycle is 60% determine: **(10)**

- (i)** Average output voltage
- (ii)** RMS output voltage
- (iii)** Effective input resistance of Chopper

Q.6 a) Explain the principle of operation of an inverter. Also, classify inverter. **(05)**

b) List different voltage control and PWM techniques used in 1 - ϕ inverter. **(05)**

OR

Explain the following performance parameters of inverters **(i)** Harmonic factor for nth harmonic **(ii)** Total harmonic distortion **(iii)** Distortion factor **(iv)** Lowest order harmonics. **(10)**

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