

**B.Tech Sem – VI (2007 Course) (Electronics) : WINTER -  
2017**  
**SUBJECT: POWER ELECTRONICS DEVICES AND CIRCUITS**

**Day: Wednesday**  
**Date: 22/11/2017**

**Time: 10.00 AM TO 01.00 PM**  
**Max. Marks: 80**

**W-2017-2516**

**N.B:**

- 1) **Q.No.1 and Q. No.5 are COMPULSORY.** Out of the remaining attempt **ANY TWO** questions.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answer to both the section should be written in **SEPARATE** answer book.
- 4) Use of non-programmable calculator is allowed.
- 5) Assume suitable data if necessary.

**SECTION-I**

- Q.1**
- a) Compare SCR and Power BJT. (05)
  - b) Describe performance parameters of single phase converters. (05)
  - c) Describe sinusoidal PWM technique. (04)
- Q.2**
- a) Describe the structure and V-I characteristics of power MOSFET. (07)
  - b) Describe the driver circuit for IGBT. (06)
- Q.3**
- a) Describe the operation of single phase half wave controlled rectifier with inductive load. Derive the expression for average output voltage in it. (07)
  - b) The three phase half wave converter is operated from a three phase wye connected 220V, 60Hz supply and load resistance is  $10\Omega$ . If the average output voltage is 25% of the maximum possible average output voltage, calculate:
    - i) Delay angle
    - ii) RMS and average output currents
- Q.4**
- a) Describe the operation of three phase bridge inverter for  $180^\circ$  conduction mode with star connected resistive load. (07)
  - b) The single phase full bridge inverter has a resistive load of  $2.4\Omega$  and DC input voltage of 48V. Determine:
    - i) RMS output voltage.
    - ii) Fundamental component of output voltage.
    - iii) First three harmonics of output voltage waveform.
    - iv) Output power consumed by load.
    - v) Fundamental power consumed by load.

**SECTION-II**

- Q.5**
- a) What is the need of resonant converter? (04)
  - b) Explain phase angle control using IC TCA785. (05)
  - c) Write short note on: Electronic Ballast. (05)

P.T.O.

- Q.6** a) With the help of neat circuit diagram and waveforms describe the operation of flyback converter. (07)
- b) A step-up chopper has input voltage of 220V and output voltage of 660V. If the nonconducting time of thyristor chopper is  $100 \mu \text{ sec.}$ , compute the pulse width of output voltage. In case pulse width is halved for constant frequency operation, find the new output voltage. (06)
- Q.7** a) Describe microprocessor based control scheme for converter. (07)
- b) An AC voltage controller has a resistive load of  $R=10 \Omega$  and rms input voltage is  $V_{\text{rms}} = 120\text{V}$ , 60Hz. The thyristor switch is on for  $n = 25$  cycles and off for  $m = 75$  cycles. Determine:
- RMS output voltage.
  - RMS output current and RMS thyristor current.
- Q.8** a) Write note on speed control of separately excited DC motor using controlled rectifier. (07)
- b) An online UPS is driving 800W, 0.8 lagging PF load, an inverter efficiency is 80% and dc link voltage and battery voltage is 48V dc. Assuming batteries are ideal. Find:
- VA rating of an inverter.
  - Wattage or peak power requirement of rectifier.
  - AH capacity of batteries required for back up time of 30 min.

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