

**B.TECH. SEM -V ELECTRONICS 2014 COURSE (CBCS) : WINTER
- 2017**

SUBJECT : POWER DEVICES AND MACHINES

Day : **Thursday**
Date : **18/01/2018**

Time : **02.30 PM TO 05.30 PM**
Max. Marks : **60**

W-2017-2147

N. B. :

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Draw neat and labelled diagram **WHEREVER** necessary.
- 4) Use of non-programmable calculator is **ALLOWED**.
- 5) Assume suitable data, if necessary.

Q. 1 Describe two transistor analogy of an SCR and derive an expression for anode current in terms of transistor parameters. **(10)**

OR

- a) Compare SCR with TRIAC. **(04)**
- b) With the help of necessary diagrams describe the principle of operation of an IGBT. **(06)**

Q. 2 A single phase half wave controlled rectifier is operated from a 220 V, 50 Hz supply and the load resistance is 20 Ω . If average output voltage is 20% of the maximum possible average output voltage calculate: **(10)**

- i) Delay angle α
- ii) Rms and average output currents
- iii) The input power factor
- iv) The rms and average thyristor current

OR

With the help of waveforms describe the working of a single phase full converter in the rectifier mode with inductive load. **(10)**

Q. 3 Describe the operation of three-phase half-wave controlled converter with resistive load. Sketch the associated waveforms also. **(10)**

OR

The three-phase semi converter is operated from three-phase Y-connected 230 V, 50 Hz supply and load resistance is $R_L = 10 \Omega$. If the average output voltage is 25 % of the maximum possible average output voltage, determine

- i) Delay angle
- ii) rms and average output currents
- iii) Rectification efficiency
- iv) Transformer utilization factor
- v) Average and rms thyristor currents

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Q. 4 Describe working and operation of single phase full bridge inverter with output waveforms. **(10)**

OR

a) Describe sinusoidal PWM Technique for inverters using 5 pulses/half cycle. **(05)**

b) Why there is necessity of feedback diode in inverter? **(05)**

Q. 5 With the help of circuit diagrams and waveforms describe step down chopper circuit and derive the expression for output voltage. **(10)**

OR

a) Define chopper. What are merits and demerits of chopper? **(05)**

b) A step down chopper feeding load with $R = 10 \Omega$ and $L = 5 \text{ mH}$ from 220 V. Supply at 500Hz and 30 % duty. Calculate average output voltage and current. **(05)**

Q. 6 a) With suitable circuitry describe Stepper motor. **(05)**

b) Differentiate Electronic Ballast over conventional Ballast with advantages and disadvantages. **(05)**

OR

a) Describe HVDC transmission with diagram and write down its advantages over HVAC transmission. **(05)**

b) With suitable circuit diagram write down the working principle of Induction motor. **(05)**

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