

B.TECH. SEM -IV ELECTRICAL 2014 COURSE (CBCS) :
WINTER - 2017
SUBJECT: POWER ELECTRONICS

Day : Monday
Date : 20/11/2017

W-2017-2078

Time : 02.30 PM TO 05.30 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) Differentiate between Transistors and Thyristors. (05)

b) Describe the different modes of operation of a thyristor with the help of its static V-I characteristics. (05)

OR

a) Explain in detail the turn-off mechanism of an SCR. (05)

b) What is Commutation of SCR? What are the different classes of forced commutation method? (05)

Q.2 a) If the half-wave controlled rectifier has a purely resistive load of R and the delay angle is $\alpha = \pi/3$. Determine (i) Rectification Efficiency (ii) Form Factor (iii) Ripple Factor. (05)

b) Describe the working of single phase fully-controlled bridge converter in the following mode (i) Rectification Mode (ii) Inversion Mode. (05)

OR

a) An SCR is used to controlled the power of 1kW, 230V, 50Hz heater. Determine the heater power for firing angle of 45° and 90° . (05)

b) Explain the effect of freewheeling diode. Also justify the statement "freewheeling diode improves the power factor of the system". (05)

Q.3 a) Draw the V-I characteristics of a DIAC and explain its working principle. (05)

b) List the advantages and disadvantage of a single-phase half-wave (unidirectional) a.c. regulator. (05)

OR

a) Describe the operation of multistage sequence control of a.c. voltage regulators with suitable power diagram. (05)

b) Draw the V-I characteristic of a TRIAC and explain its working principle. (05)

Q.4 a) Draw and explain the output characteristic of n-channel enhancement mode MOSFET. (05)

b) Explain the parallel operation of IGBT. Also, mention the problems faced while parallel – operation. (05)

OR

a) With the help of block diagram, explain the operation of solid-state UPS system. (05)

b) With the help of block diagram explain the operation of SMPS. (05)

P.T.O.

Q.5 a) Draw the schematics of step-down & step-up choppers and state the comparison between them. **(05)**

b) With the circuit diagram and output voltage waveforms, explain the working of Jones Chopper. **(05)**

OR

a) Explain the Time Ratio Control and Current Limit Control and control strategies used for chopper. **(05)**

b) Derive the expression for I_{omax} and I_{omin} for Class A Chopper. Also, derive the expression for per unit ripple current. **(05)**

Q.6 The single phase half and bridge inverter has a resistive load of 10Ω and the center tap dc input voltage is 96 V. Compute **(i)** RMS value of output voltage **(ii)** fundamental component of the output voltage waveform **(iii)** power consumed by the load **(iv)** first 5 harmonics of the output voltage waveform **(v)** RMS power consumed by the load. **(10)**

OR

A single phase full bridge inverter is operated from a 48 V battery and is supplying power to a pure resistive load of 15Ω . Determine : **(10)**

i) Fundamental output voltage and its first 5 harmonics.

ii) RMS value of output voltage

iii) Output RMS power and output fundamental power

iv) Transistor switch ratings.

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