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T.E. Electrical V CBSGS 9.6.17

QP Code:584401

22

(3 Hours) [Total Marks :80

N.B. : (1) Question No. **1** is **compulsory.**
(2) Answer any **three** from the remaining **five** questions.
(3) **Assume** suitable **data** if necessary and justify the same.
(4) **Figures** to the **right** indicate the marks.

1. Solve any **four**. All the questions carry equal marks. 20
   (a) State and explain the application of controlled rectifier and Inverter.
   (b) Compare the performance of MOSFET, BJT and IGBT with respect to voltage rating, current rating, switching frequency, power application and gating.
   (c) Explain the principle of operation of power MOSFET.
   (d) Explain the effect of freewheeling diode in single-phase half-wave rectifier with RL load.
   (e) Why there is restriction on firing angle in case of AC Voltage Controller feeding highly inductive load.

2. (a) State the limitation of R-firing circuit and explain the working of RC half wave triggering circuit. 10
   (b) Explain the constructional detail of IGBT with equivalent circuit and discuss its characteristics. 10

3. (a) Draw a neat circuit and explain the working of fully controlled 6-pulse 3-phase bridge converter with resistive load. Draw the corresponding input and output voltage waveforms when the firing angle is 60 degrees. Also obtain the expression for output voltage. 10
   (b) Explain 1-phase Half controlled rectifier with RL load with and without freewheeling diode. 10

4. (a) Explain the operation of three-phase bridge inverter for 120^0 conduction mode, draw the necessary waveform for line voltage and phase voltage. Justify it. 10
   (b) Discuss the different method of Harmonic reduction. 10

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5. (a) Explain with a neat circuit diagram and relevant waveforms the working of BOOST regulator and derive the expression for output voltage filter capacitance and filter inductance. 10

(b) A buck regulator has an input voltage of Vs=14V. The required average output voltage is V_0 = 6V and peak to peak output ripple voltage is 15mV. The switching frequency is 30kHz. If the peak to peak ripple current of inductor is limited to 0.6 A. Determine (a) the duty cycle α, (b) the Filter Inductor L, and (c) the filter capacitor C. 10

6. (a) Explain in detail with circuit diagram and waveforms, single phase cycloconverter. 10

(b) Explain with circuit diagram and waveform the working of single-phase bidirectional phase control type AC voltage controller connected to RL load. 10
