

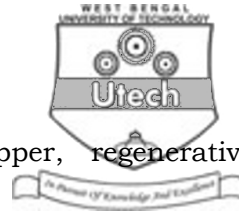
Invigilator's Signature :



- iii) The advantage of an 180° conduction three phase inverter over an 120° conduction three phase inverter is
- a) it needs less number of switches
 - b) there is no paralleling of switches
 - c) devices in series are not simultaneously switched
 - d) load terminals are not left open during switching.
- iv) The output voltage waveform of a three phase square wave inverter contains
- a) only odd harmonics
 - b) both odd & even harmonics
 - c) only even harmonics
 - d) only triplex harmonics
- v) A free wheeling diode across inductive load of a phase controlled converter will provide
- a) quick turn-on of SCR
 - b) slow turn-off of SCR
 - c) reduced utilization factor of transformer
 - d) improved power factor.



- vi) Switching mode power supplies are superior to linear power supplies in respect of
- a) size and efficiency b) efficiency & regulation
 - c) regulation & noise d) noise & cost.
- vii) HVDC transmission is preferred to EHV-AC transmission because
- a) HVDC terminal equipment are expensive
 - b) VAR compensation is not required for HVDC systems
 - c) system stability can be improved
 - d) both (b) & (c)
- viii) Presence of drift layer in a power semiconductor device
- a) increases breakdown voltage rating
 - b) increases on state current rating
 - c) increases switching speed
 - d) decreases on state resistance.
- ix) The switching frequency of a MOSFET will be reduced with
- a) an increase in the output impedance of the device
 - b) an increase in the discharge rate of the input capacitance.
 - c) an increase in the source resistance
 - d) a decrease in the discharge rate of the input capacitance.



- x) For a two quadrant type-A chopper, regenerative braking is
- a) possible at low speeds
 - b) possible at high speeds
 - c) possible at both high & low speeds
 - d) not possible at all.
- xi) The range of firing angle for RC firing circuit is
- a) $0^\circ - 90^\circ$
 - b) $90^\circ - 180^\circ$
 - c) $0^\circ - 180^\circ$
 - d) $45^\circ - 90^\circ$.
- xii) RC snubber circuit is used to limit rate of
- a) rise of current in SCR
 - b) rise of voltage across SCR
 - c) rise of capacitance of depletion layer
 - d) all of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Discuss briefly with relevant waveforms, the voltage commutation technique used for the commutation of SCRs.
3. Compare the features of an IGBT with a power transistor.



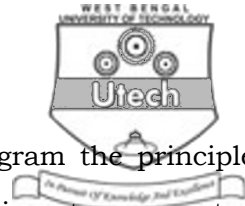
4. Explain briefly the working of class C chopper with relevant diagrams.
5. Describe the effect of source inductance on the *dc* output voltage of a single phase full controlled bridge converter.
6. Explain with relevant circuit diagrams & waveforms, the principle of operation of single phase to single phase step-up cycloconverter.

GROUP – C

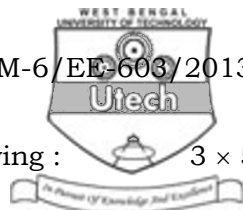
(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) With the help of associated waveforms & circuit diagrams, explain the principle of operation & derive the expression of average output voltage of a 3 phase full converter supplying a very high inductive load.
- b) A three phase fully controlled SCR bridge converter is supplied with 230 V (RMS) per phase. The source inductance per phase is 0.005 H. The load is highly inductive with constant load current of 20A. Compute –
 - i) firing angle for an output voltage of 436 V
 - ii) overlap angle. $7 + 8$



8. a) Discuss with appropriate circuit diagram the principle of operation of a three phase bridge inverter connected with star connected resistive load. The period of conduction of each SCR is 180° . Draw phase & line voltage waveforms of the load. The sequence of firing of various SCRs should also be indicated in the diagram.
- b) Explain the working of a resonant pulse inverter. 9 + 6
9. a) What is the principle of operation of boost regulator ? Deduce the expression of output voltage.
- b) The step-down chopper has a resistive load of 10 ohm & the input voltage is 200V. When the chopper is turned on, the voltage drop across the switch is 1V, the chopping frequency is 1 kHz. If the duty cycle is 40%, determine the average output voltage, rms output voltage, efficiency of the chopper & effective input resistance of the chopper. 7 + 8
10. a) Explain with appropriate circuit diagram & waveforms, techniques to improve power factor of phase controlled converters.
- b) How are control of output voltage & harmonic reduction in the output voltage achieved in the inverter ? 8 + 7



11. Write short notes on any *three* of the following : 3×5

- a) Speed control of AC motor with power electronic devices.
 - b) Multi-phase choppers
 - c) Three phase AC controllers
 - d) Parallel operation of SCRs
 - e) GTO.
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