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Question Paper Code : 12293

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2026.

Fifth Semester

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Electrical and Electronics Engineering

EE3591 – POWER ELECTRONICS

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is a snubber Circuit?
2. Write a duty ratio range for buck operation in buck boost converter.
3. List the various types of harmonics reduction techniques.
4. Distinguish between VSI and CSI.
5. What is the advantage of using bridge rectifier over midpoint tapped rectifier?
6. What is the use of capacitor in rectifier?
7. Determine the average output voltage of a three-pulse converter when operated with a firing angle of 45° , and fed with an input voltage of 230V, 50Hz ac input.
8. Define displacement factor.
9. What is the extinction angle?
10. How will you bias the TRIAC to produce negative triggering pulse?

PART B — (5 × 13 = 65 marks)

11. (a) Draw and explain the dynamic behaviour of MOSFET.

Or

- (b) With a neat power circuit diagram and waveforms explain any one of the resonant converters.

12. (a) With a neat power circuit diagram and waveforms explain the working of single-phase full bridge inverter with RL loads.

Or

- (b) Explain voltage control of single - phase full bridge inverter with single pulse modulation technique.

13. (a) Draw and explain the working of voltage doubler circuit.

Or

- (b) Explain the diode bridge rectifier with power circuit diagram and waveforms.

14. (a) Draw and explain the two-transistor analogy of SCR.

Or

- (b) Explain the effect of source inductance in 2 pulse converter with diagram and derive the average output voltage.

15. (a) With neat circuit diagram and waveforms, explain the working of single-phase bidirectional ac voltage controller for RL load. Draw the waveforms for a firing angle of 60° .

Or

- (b) Explain the working of TRIAC based AC voltage controllers.

PART C — ($1 \times 15 = 15$ marks)

16. (a) A boost converter has an input voltage of 6V. The average output voltage is 15V and the average load current is 0.5A. The switching frequency is 20kHz. If the inductor used in the circuit is $L = 0.25\text{mH}$ and a $440\mu\text{F}$ capacitor is connected across the load, determine

- (i) the duty cycle,
- (ii) the ripple current of the inductor and
- (iii) the ripple voltage of the filter capacitor.

Also draw the boost converter circuit and derive the appropriate expressions used for finding (i) to (iii).

Or

- (b) A 2-pulse converter is operated with symmetrical angle control for achieving desired power factor. The load current is assumed to be continuous and ripple free.

- (i) Express the input current of the converter in Fourier series, and determine the harmonic factor, displacement factor and input power factor.
- (ii) If the conduction angle $\beta = 120^\circ$ and the input voltage is 230V, 50Hz, calculate V_{DC} , V_{rms} , HF, DF and PF.