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Question Paper Code : 82287

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2025.

Fifth Semester

Electrical and Electronics Engineering

EE 3591 — POWER ELECTRONICS

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Draw the block diagram of switched mode regulators.

2. The boost regulator has an input voltage 10 V and the average output voltage is 30 V. Find the duty cycle.

3. List any four applications of inverters in industries.

4. List the performance parameters of inverter.

5. Define transformer utilization factor.

6. Define the term power quality.

7. List the applications of controlled rectifier.

8. Define displacement factor.

9. Mention the merits of AC phase controllers with positive gate pulse triggering.

10. A single phase voltage controller has input voltage 220 V, 50 Hz with a load of 10 ohms. For 4 cycle ON and 4 cycles OFF find the rms output voltage.

PART B — (5 × 13 = 65 marks)

11. (a) Explain the modes of operation of buck converter with required sketch.

Or

(b) Explain the operation of isolated flyback converter with suitable sketch.

12. (a) Explain the operation and characteristics of single phase half bridge inverter with required sketch.

Or

(b) Explain the harmonic elimination with transformers and their connections with suitable sketch.

13. (a) Explain the operation of mid-point secondary transformer based full wave rectifier with R load using necessary sketch and waveforms.

Or

(b) Explain the operation of single phase full wave diode rectifier with capacitor Filter (C type) using required sketch and relations.

14. (a) Explain the operation of single phase fully controlled bridge rectifier with R load using necessary sketch and relations.

Or

(b) Explain the effect of source impedance in a single phase fully controlled rectifier with necessary sketch.

15. (a) Explain the operation of single phase AC voltage controller with R load using necessary sketch.

Or

(b) Explain the operation of three phase bidirectional AC voltage controller with star connected load using necessary sketch.

PART C — (1 × 15 = 15 marks)

16. (a) A single phase half wave converter is operated from a 220 V, 50 Hz supply. If the load is resistive of value 10 ohms and delay angle $\propto = 90°$. Estimate the following:

(i) Efficiency

(ii) Form factor

(iii) Ripple Factor

(iv) Transformer utilization factor

(v) Peak inverse voltage of thyristor.

Or

(b) A single phase full wave converter is functioning from a 230 V, 50 Hz for a pure resistive load of 50 ohms. If the average output voltage is 30% of maximum possible average output voltage. Calculate:

(i) Delay angle

(ii) Average output current

(iii) RMS output current

(iv) Average thyristor current

(v) RMS thyristor current.