

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V EXAMINATION – SUMMER 2025

Subject Code:3152407

Date:15-05-2025

Subject Name:Power Electronics Circuits - I

Time:02:30 PM TO 05:00 PM

Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

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| Q.1 | (a) | Draw only the circuit diagram and waveforms of single-phase half-wave controlled rectifier with R-L load. | 03 |
| | (b) | Define Input Power Factor, Crest Factor, Input Current Distortion Factor and Input Current Harmonic Factor for rectifier. | 04 |
| | (c) | Discuss the operation of Buck converter with the help of a circuit diagram and waveforms. Derive the expression for output voltage. | 07 |
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| Q.2 | (a) | Explain the operation of first quadrant (Type-A) chopper. | 03 |
| | (b) | Discuss the importance of isolation in power electronics circuits. List the advantages of isolated DC-DC converter. | 04 |
| | (c) | Explain the working of the M-type ZCS resonant converter. Draw necessary circuit diagram and waveforms. | 07 |
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| OR | | | |
| | (c) | Explain the working of ZVS resonant converter. Draw necessary circuit diagram and waveforms. | 07 |
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| Q.3 | (a) | Explain R-C Triggering circuit for single-phase controlled rectifiers. | 03 |
| | (b) | Explain the working of single-phase half-wave uncontrolled rectifier with L load. Draw necessary circuit diagram and waveforms. | 04 |
| | (c) | Explain the operation of single-phase semi-converter and derive the expression of output voltage. Draw necessary circuit diagram and waveforms. | 07 |
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| OR | | | |
| Q.3 | (a) | Draw only the circuit diagram and waveforms of single-phase full-wave controlled rectifier with R load. | 03 |
| | (b) | Explain the working of single-phase half-wave uncontrolled rectifier with R-E load. Draw necessary circuit diagram and waveforms. | 04 |
| | (c) | Explain the working of single-phase dual converter. Draw necessary circuit diagram and waveforms. | 07 |
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| Q.4 | (a) | Explain time-ratio control and current limit control methods for DC chopper. | 03 |
| | (b) | Explain the working of single-phase full-wave uncontrolled rectifier with R-L-E load. Draw necessary circuit diagram and waveforms. | 04 |
| | (c) | Write a technical note on Jones Chopper. | 07 |
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| OR | | | |
| Q.4 | (a) | Explain the operation of second quadrant (Type-B) chopper. | 03 |
| | (b) | Draw only the circuit diagram and waveforms of three-phase full-wave uncontrolled rectifier with R load. | 04 |
| | (c) | Write a technical note on Multiphase Chopper. | 07 |
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| Q.5 | (a) | Explain the effect of source inductance in uncontrolled rectifiers. | 03 |
| | (b) | Draw only the circuit diagram and waveforms of the Buck-Boost converter. | 04 |
| | (c) | Explain the working of Fly back converter. Draw necessary circuit diagram and waveforms. | 07 |

OR

- Q.5**
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|------------|---|-----------|
| (a) | Explain the significance of free-wheeling diode in rectifiers. | 03 |
| (b) | Draw only the circuit diagram and waveforms of CUK converter. | 04 |
| (c) | Explain the working of push-pull converter. Draw necessary circuit diagram and waveforms. | 07 |
