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# B.M.S. College of Engineering, Bengaluru-560019

**Autonomous Institute Affiliated to VTU**

## October 2024 Supplementary Examinations

**Programme: B.E.** **Semester: VI**
**Branch: Electrical and Electronics Engineering** **Duration: 3 hrs.**
**Course Code: 22EE6PCPE2** **Max Marks: 100**
**Course: Power Electronics - 2**

**Instructions**: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.



**Important Note:** Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

| | | UNIT - I | CO | PO | Marks |
|---|---|---|---|---|---|
| 1 | a) | With the help of a neat diagram and associated waveforms, explain the operation of a single-phase full wave controlled converter with<br>(i) Resistive load<br>(ii) Inductive load | CO2 | PO1, PO2 | **10** |
| | b) | Explain the operation of a three-phase, fully-controlled bridge converter with associated waveforms. | CO2 | PO1, PO2 | **10** |
| | | **UNIT - II** | | | |
| 2 | a) | Draw the schematics of step-down and step-up DC to DC convertors. Derive expression for output voltage in terms of a duty cycle for a step-down and step-up converter. | CO2 | PO1, PO2 | **10** |
| | b) | A step-down dc chopper has a resistive load of R = 15 ohm and input voltage $E_{dc}$ = 200 V. When the chopper remains ON, its voltage drop is 2.5 V. The chopper frequency is 1 kHz. If the duty cycle is 50%,<br>determine: (a) Average output voltage<br>(b) RMS output voltage<br>(c) Chopper efficiency<br>(d) Effective input resistance of chopper | CO3 | PO1, PO2 | **10** |
| | | **OR** | | | |
| 3 | a) | With the help of a neat circuit diagram and associated waveforms, discuss the operation of the Buck-Boost converter. List the advantages and disadvantages of this type of converter. | CO2 | PO1, PO2 | **12** |
| | b) | A DC-DC boost regulator has Vs= 5V, Va=15V and average current through the load is 0.5A. Given inductor ripple current is 0.9A and capacitor voltage ripple is 60mV compute the values of L and C of the converter. Draw the circuit and insert the values on it. Given switching frequency is 10kHZ. | CO2 | PO1, PO2 | **08** |
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| | | | **UNIT - III** | | | |
| | 4 | a) | Derive the following expression for the single-phase full bridge transistorised VSI<br>(i) RMS output voltage<br>(ii) Instantaneous output voltage<br>(iii) Nth harmonic component<br>Switch voltage and current rating | *CO2* | *PO1, PO2* | **10** |
| | | b) | A full-bridge inverter has a source voltage $E_{dc}$=220 V. The inverter supplies an RLC load with R=10 ohm and C=52 µF. The inverter frequency is 400 Hz. Determine<br>(i) The RMS load current at fundamental frequency<br>(ii) The RMS value of the load current<br>(iii) The power output and<br>(iv) The average supply current | *CO2* | *PO1, PO2* | **10** |
| | | | **OR** | | | |
| | 5 | a) | With the help of a neat circuit diagram and waveforms, explain briefly the operation of a transistorised three-phase bridge inverter with resistive load in $180^0$ conduction mode. | *CO1* | *PO2* | **10** |
| | | b) | A single-phase full-bridge inverter is operated from a 48 V Battery and supplies power to a pure resistance load of 10 Ohm. Determine<br>(i) The fundamental output voltage and the first five harmonics<br>(ii) RMS value by direct integration method and harmonics summation method.<br>(iii) Output rms power and output fundamental power | *CO1* | *PO1, PO2* | **10** |
| | | | **UNIT - IV** | | | |
| | 6 | a) | With the help of neat diagram and associated waveforms, explain the operation of ZVS resonant converter. | *CO3* | *PO2* | **10** |
| | | b) | With the help of neat diagram and associated waveforms, explain the operation of ZCS resonant converter. | *CO3* | *PO2* | **10** |
| | | | **UNIT - V** | | | |
| | 7 | a) | Describe the operation of on-line UPS system with the help of neat block diagram. | *CO3* | *PO2* | **10** |
| | | b) | With neat circuit diagram and waveform explain the working of a single phase full converter fed DC motor. | *CO3* | *PO2* | **10** |



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