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Code No. : 21703

VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD

M.E. (EEE: CBCS) I-Semester Main Examinations, January-2018

(Power Systems & Power Electronics)

Power Electronic Converters

Time: 3 hours

Max. Marks: 60

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

1. Discuss the current waveform of an inductor circuit in series with a diode connected to an AC voltage source.
2. Explain the operation of an RL circuit in series with a diode fed from an AC source.
3. Draw the circuit diagram of half bridge voltage source inverter.
4. Explain the operation of a three phase diode bridge rectifier circuit.
5. Draw the circuit diagram of a buck boost converter and explain its principle of operation.
6. A step down DC to DC converter is fed with input DC voltage of 400V. For the on time of 5ms. Calculate the chopper frequency for the output DC voltage of 100V.
7. For inverters, give the main advantage of using IGBT as compared to the use of thyristors.
8. What is sinusoidal pulse width modulation?
9. Describe in a few sentences, the principle of a system to obtain single phase 16.66Hz supply from a single phase 50Hz supply.
10. Explain the operation of a single phase cycloconverter.

Part-B (5 × 8 = 40 Marks)

(All sub-questions carry equal marks)

11. a) Explain the working of a single phase diode circuit for charging a battery and find expression for battery charging current
b) AC supply of 220 V, 50 Hz is rectified using a diode and connected to a resistive load. Find the efficiency of rectification.
12. a) Derive an expression for the DC output voltage of a three phase full wave rectifier, its principle of operation drawing the wave forms of output voltage, output current and phase current.
b) A battery of 12 V is charged through a diode and a current limiting resistor R supplied from the secondary of a single phase transformer. Primary voltage of the transformer is 440V, 50Hz and its turns ratio is 2:1. Calculate the conduction angle of the diode, average charging current and value of current limiting resistor R.
13. a) Explain the operation of a CUK converter and find an expression for the average output DC voltage in terms of duty cycle
b) A buck converter feeding an RL load has a supply voltage of 220 V DC, $R = 5\Omega$, $L = 7.5\text{mH}$ and Switching frequency $f = 1\text{ kHz}$, Duty cycle is 50%. Calculate the output voltage.
14. a) Explain the operation of a single phase bridge inverter with wave forms.
b) Describe techniques for harmonic elimination in inverters.

- 15. a) Describe the operation of a matrix converter and its advantages and limitations.
- b) Discuss the operation and control of a three phase cycloconverter to get output of a certain frequency.
- 16. a) Analyze the single phase full wave rectifier circuit with R L E load for continuous and discontinuous load current.
- b) Draw the circuit diagram of a single phase semiconverter and derive expression for average DC output voltage and rms output voltage.
- 17. Answer any *two* of the following:
 - a) Derive an expression for output voltage of buck converter
 - b) Explain various PWM techniques employed in inverters for voltage control
 - c) Discuss the classification of choppers into various categories.

