

M. Tech. Electrical Power System (CBCS Pattern) Sem-II  
**PEPS21 - Advanced Power Electronics**

P. Pages : 2

Time : Three Hours



**GUG/W/22/11021**

Max. Marks : 70

- Notes :
1. All questions carry equal marks.
  2. Due credit will be given to neatness and adequate dimensions.
  3. Assume suitable data wherever necessary.
  4. Illustrate your answers wherever necessary with the help of neat sketches.
  5. Use of Mollier's chart, non programmable calculator is permitted.

1. a) Compare the following : 8
  - i) Power MOSFET & Power BJT
  - ii) Power MOSFET & IGBT
- b) Describe gate drive circuit of G.T.O. in brief. 6
2. a) Draw the switching characteristics of IGBT. Define turn ON delay time, rise time, turn ON time, turn-off delay time, first fall time & final fall time. 7
- b) Explain with modes of operation and wave form the working of DC – DC Boost converter connected to R-E load. 7
3. a) What is the working principle of regenerative breaking of dc-dc converter fed dc motor drives? Also explain. 6
  - i) Rheostatic breaking
  - ii) Two quadrant chopper fed dc drive
  - iii) Four quadrant chopper fed dc drive
- b) The boost converter has an input voltage ( $V_s$ ) of 6V. The average output voltage ( $V_a$ ) is 15V & average load current ( $I_a$ ) is 0.5A. The switching frequency is 20 KHz. If L is 250  $\mu$ H & C is 440 micro  $\mu$ F . 8

Determine :

  - i) Duty cycle
  - ii) The ripple current of inductor ( $\Delta I$ )
  - iii) The peak current of inductor ( $I_2$ )
  - iv) The ripple voltage of filter capacitor ( $\Delta V_c$ ).
  - v) The critical values of L & C.

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|----|------|--|----|
| 4. | a)   | Explain Push – Pull DC-DC converter using modes of operation & waveform. How the voltage output will be controllable.                              | 8  |
|    | b)   | Why the design of a dc inductor different from that of an inductor.  | 6  |
| 5. | a)   | What is pulse width modulation inverters? What are different PWM techniques used in inverter? Explain any one PWM technique with suitable example. | 7  |
|    | b)   | Explain two quadrant dc-dc converter with modes of operation for R-L Load.   | 7  |
| 6. | a)   | Explain parallel resonant inverter in brief.   | 7  |
|    | b)   | Explain with waveforms & circuit diagram series resonant converter using bidirectional switches.   | 7  |
| 7. | a)   | How zero voltage switching technique is used to improve the efficiency of DC-DC converter? Explain.  | 7  |
|    | b)   | Explain 3-phase DC link inverter to obtain variable voltage & frequency output for driving 3-phase load with 180° mode of operation.               | 7  |
| 8. |      | Write short notes on <b>any four</b> .   | 14 |
|    | i)   | Block diagram of on-line UPS.  |    |
|    | ii)  | Block diagram of off-line UPS.   |    |
|    | iii) | Quasi resonant inverter.   |    |
|    | iv)  | Full wave rectifier with R-L load.   |    |
|    | v)   | Total Harmonic distortion.   |    |
|    | vi)  | Ferrite Core Transformer.  |    |

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