*3693*

# Power Electronics - I
## (New) (1210)

**P. Pages : 3**

**Time : Three Hours**                                      **Max. Marks : 100**

Instructions to Candidates :
1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory and carry equal marks.
5. Assume, Suitable data if necessary.
6. Use of non - programmable calculator is allowed.

## UNIT - I

1.      Attempt **any two.**                                                    **10**
   a) Explain what is the need for forced commutation of SCR ? Draw circuit diagram and explain working of class - D, Auxiliary commutation circuit ? Draw relevant waveforms ?

   b) Draw the structure and explain what do you mean by depletion       **10** type and enhancement type MOSFET ? Explain working ? Draw and explain the output & transfer characteristics ?

   c) Draw the turn on and turn off gate drive circuit for GTO and explain **10** its operation ? Also explain the term maximum controllable current ?

## UNIT - II

2.      Attempt **any two.**
   a) A three phase fully controlled converter is operated from 415 volts, **10** 50Hz, $3\phi$ A.C supply, if the load voltage is 380 volts at a constant load current of 10A and firing angle of $\alpha = \frac{\pi}{4}$ rad, calculate,
   i)    Source inductance Ls
   ii)   load Resistance $R_L$
   iii)  Overload angle $\mu$
   iv)   Vdc for $\alpha = 30^0$ & Idc = I5A

b) Draw the circuit diagram of $1-\phi$ full bridge ac - dc - converter. Draw the waveforms for input and output voltage and current and derive expression for input performance parameter ? **10**

c) Draw a neat circuit diagram of three phase full bridge converter. Explain working and draw waveforms for input and output voltage for $\alpha = 30^0$ and $90^0$, derive relation for $V_{dc}$ ? **10**

## UNIT - III

3. Attempt **any two**

a) In a step down converter, consider all components to be ideal. Let $V_0 = V_0$ be held constant at 5V, by controlling the switch duty ratio D. Calculate the minimum inductance L required to keep the converter operation in a continuous conduction mode under all conditions if Vd 10 - 40 V, $Po \geq 5w$ and Fs = 50KHz. **10**

b) In a step - up converter, consider all components to be ideal Let Vd be 8 - 16 V, Vo = 24 V, Fs = 20KHz and $C = 470\mu f$, calculate $I_{min}$ that will keep the converter operating in a continuous - conduction mode if $Po \geq 5W$. **10**

c) Discuss the different types of protection need in SMPS. Draw and explain the block diagram of UC 1524 A **10**

## UNIT - IV

4. Attempt **any two.**

a) Draw the circuit diagram and explain working of parallel inverter with suitable waveforms ? Explain the design procedure. **10**

b) Explain the PWM switching scheme of the inverters ? Explain the terms $m_a$ and $m_f$ with their significance ? Show that for sinusoidal PWM (VA0) is $m_a$ times Va/2 ? **10**

c) Draw the circuit diagram of three phase bridge inverter ? Explain its operations with square wave switching scheme ? **10**
Show that, $V_{AD} = \dfrac{2}{3} V_{AN} - \dfrac{1}{3} \left(V_{BN} + V_{CN}\right).$

## UNIT - V

5.  Attempt **any two**

    a)  Draw & explain the SLR dc – dc converter for discontinuous mode of operation. Draw its capacitor voltages & inductor current waveforms.    **10**

    b)  Explain the class E Converter for optimum & non optimum mode.    **10**

    c)  Explain zero voltage & current switching.    **10**

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