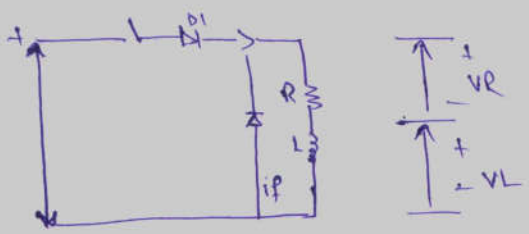
Assigneering

Course Title Power Electronics

Instructor Engr. Shayan Taqvir

Name Azaj Ali ID 11440

Q1 (a) Solution A diode circuit with an RL load.



when switch si is closed at t=0 the current though the inductor increase and is expressed as

$$V_S = V_L + V_R = L\frac{di}{dt} + Ri$$

with the initial, $i(t=0) = 0$ $i(t)$ is expressed

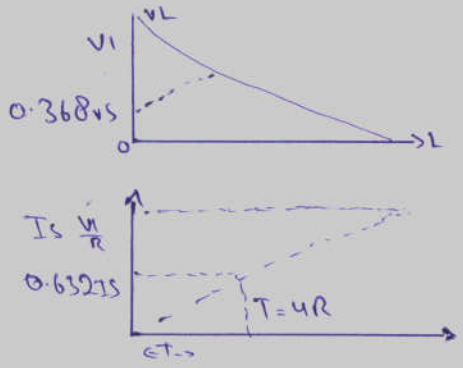
$$i(t) = \frac{V_S}{R}(1 - e^{-tR/2})$$

the initial rate of rise of the current at t=0 is obtained $\left.\frac{di}{dt}\right|_{t=0} = \frac{V_S}{L}$

The voltage across the inductor is

$$V_L(t) = L\frac{di}{dt} \cdot V_S e^{-LR/L}$$

where L/R-s is the time constant of an RL load. the wave forms for the voltage and current.



Free wheling Diode

→ A Free wheling diode is basically a diode connected across the inductive load ter minutes to Prevent the develpment of high voltage across the switch.

→ when the inductive circuit is switched off this diode gives a short circuit.

Path for the flow of inductor decay current and hence dissipation of stored energy in the inductor.

→ this diode is also called flywheel fly back diode

Q1 (b) Given Data:

$V_{DS} = 44V$

$V_T = 0V$

find V_{GS}

Solution

If we know the.

where for saturation

$V_{DS} = V_{GS} - V_T$

$V_{DS} = V_{GS} = V_T$

$V_{DS} = V_{GS} - V_T$

where

$V_{GS} = V_{DS} + V_T$

Putting value

$V_{GS} = 44 + 0$

$\boxed{V_{GS} = 44V}$ Ans

Q2 a

Ans A powe electronic appliance of 500w, 220v. 500l2Hz rating is using a power mosfet for switching purpose. The power mosfet is replaced with power bizpolar juction transistor ~~with~~ its effect on his performance and losses and efficiency on the appliance. the switching frequency will be lower of appliance because mosefet have high switching frequency the Biopolar juction transistor.

The losses will be low because losses in BJT is less than mosfet have high switching frequency than BJE loss in appliance will be low another reason losses.

The BJE cannot operate at high frequency one of the impact on performance 500l2Hz on state voltage law for Bit so the frequency of the impact on performance

The switching losses ~~impact~~ will increase due to Bit in appliance. But conduction losses will be ~~dec~~ decreas because of Bit replace not appliance.

Q2 (B)

Ans The above appliance Qa if the mosfet replaced with SCR as switch and impact its performance losses and effeciency is given. the SCR have no capabilities to handle high frequencies and will impact on its performance losse and efficaney The SCR an handle more power voltage current which increase the efficency of the appliance and one of the advantages efficency.

The SCR can protected because of the fuse. which can decrease losses used as the performance of the applince improve.

Q3 a)

Given data:

Range 8 to 40

$RC = 4\Omega$

$V_{CC} = 440V$

$V_D = 10V$

$V_{CE} = 1V$

$V_{BE} = 1.5V$

Sol:

$$I_{CS} = \frac{V_{CC} - V_{CE(sat)}}{R_C}$$

$$= \frac{440 - 1}{40} = 10.9A$$

$$I_{BS} = \frac{I_{CS}}{\beta_{min}}$$

$$\frac{10.9}{8} = 1.3A$$

$$I_B = ODF \times I_B$$

$$= 5 \times 1.3$$

$$I_B = 6.5A$$

$$I_B = \frac{V_B - V_{BE(sat)}}{R_B}$$

$$R_B = \frac{V_B - V_{BE(sat)}}{I_B}$$

$$R_B = \frac{10V - 1.5V}{1.5}$$

$$R_B = 5.6\Omega$$

$$\beta_F = \frac{I_{CS}}{I_B}$$

$$= \frac{10.9}{6.5}$$

$$\beta_F = 1.6$$

$$P_T = V_{BF} I_B + V_{CE} I_C$$

$$P_T = 1.5 \times 6.5 + 1 \times 10.9$$

$$P_T = 20.6w \text{ Ans}$$