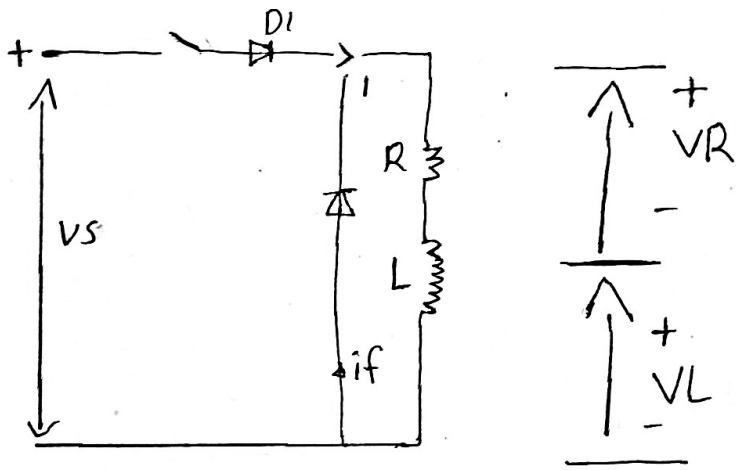
ID = 11445

Name: Abid Khan Subject: P.E

Question no: 1 (a part)

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

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

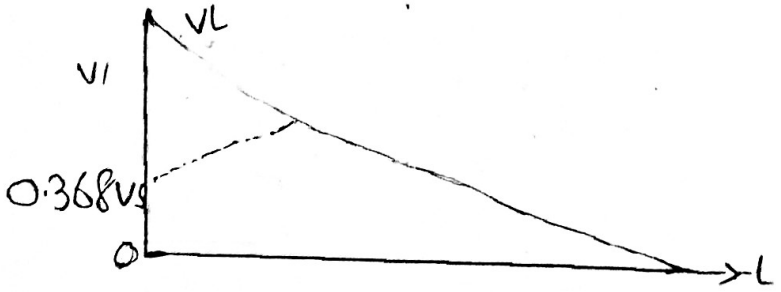
the initial rate of rise of the current cat $t = 0$ is obtained

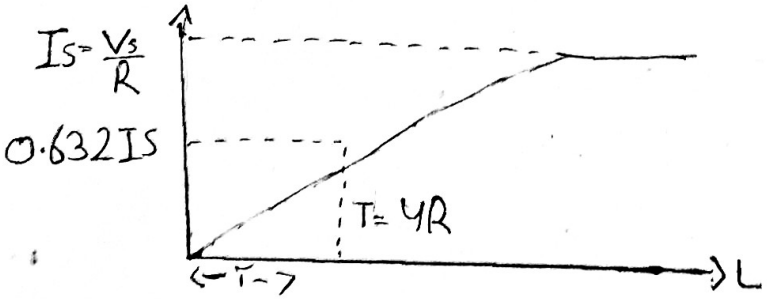
$$\frac{di}{dt}\Big|_{t=0} = \frac{V_s}{L}$$

The voltage across the inductor is

$$V_L(t) = L\frac{di}{dt} = V_s e^{-tR/L}$$

Where $L/R = \gamma$ is the time constent 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 terminates 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.

ID: 11445

Abid Khan

Power Electronics

Question no: 1 (b part)

Given Data:

$V_{DS} = 45V$

$V_T = 5V$

Find V_{as}=

Solution:

At we know the.

Where for saturation

$V_{DS} \geq V_{as} - V_T$

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

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

Where

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

Putting value.

$V_{as} = 45 + 5$

$\{V_{as} = 50v\}$ Ans.

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Question no: 2. a Part

Answer:

A Power electronic appliance of 500w 220v, 50Hz rating is using a Power mosfet for switching purpose The Power mosfet is replaced with power bipolar junction transistor 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 Bio Polar junction 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 500KHz on state voltage low for Bjt so the frequency of the impact on Performance The switching losses will increase due to Bjt in appliance. But conduction losses will be decrease because of Bjt replace mat appliance.

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Question no 2. B Part.

Answer:

The above appliance 2a 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 efficency. The SCR an handle more power voltage current which increase the efficeney of the appliance and one of the advantages effiency!

The SCR can Protected because of the fuse, which can decrease losses used as the performance of the applicance improve.

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Question no: 3

Given data:

Range 8 to 40.

RC = 45Ω

VCC = 445V

VD = 10V

VCE = 1V

VBE = 1.5V

Solution:

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

$$= \frac{445 - 1}{45} = 9.8A$$

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

$$= \frac{9.8A}{8} = 1.2A$$

$$I_B = ODF \times I_B$$

$= 5 \times 1.2$

$IB = 6\ A$

$$IB = \frac{VB - VBE(sat)}{RB}$$

$$RB = \frac{VB - VBE(sat)}{IB}$$

$$RB = \frac{10V - 1.5V}{6}$$

$RB = 1.4\Omega$

$$BF = \frac{Ics}{IB}$$

$$= \frac{9.8}{6}$$

$BF = 1.6$

$PT = VBE\ IB + VCEIC$

$PT = 1.5 \times 6 + 1 \times 9.8$

$PT: 18.8$ Ans