Department of Electrical Engineering
Assignment
Date: 14/04/2020

Course Details

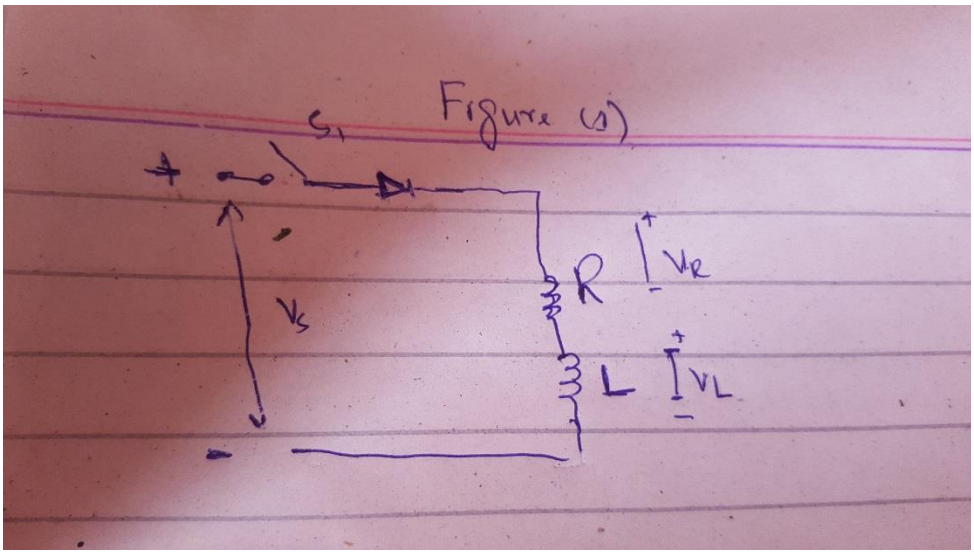
Course Title:	Power Electronics	**Module:**	8th
Instructor:	Engr shayan tariq jan	**Total Marks:**	30

Student Details

Name:	shahkar khan	**Student ID:**	13026

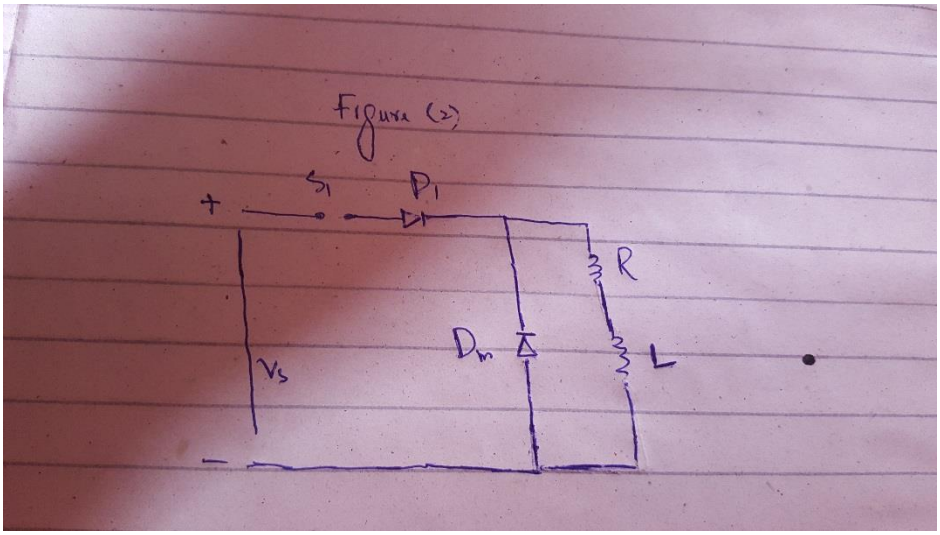
Question1

A)part



Inductor have property to store energy .

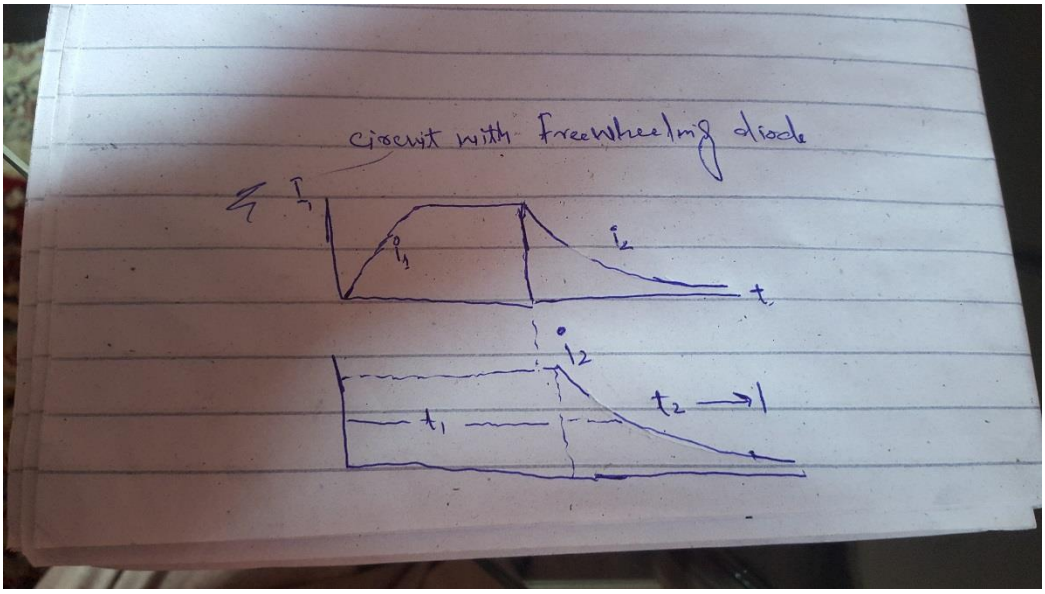
During ac supply the positive cycle inductor store energy and during negative cycle inductor de-energize. decay current and dissipation of store energy take place and creation of high voltage across switch.



When freewheeling diode is connected to RL circuit

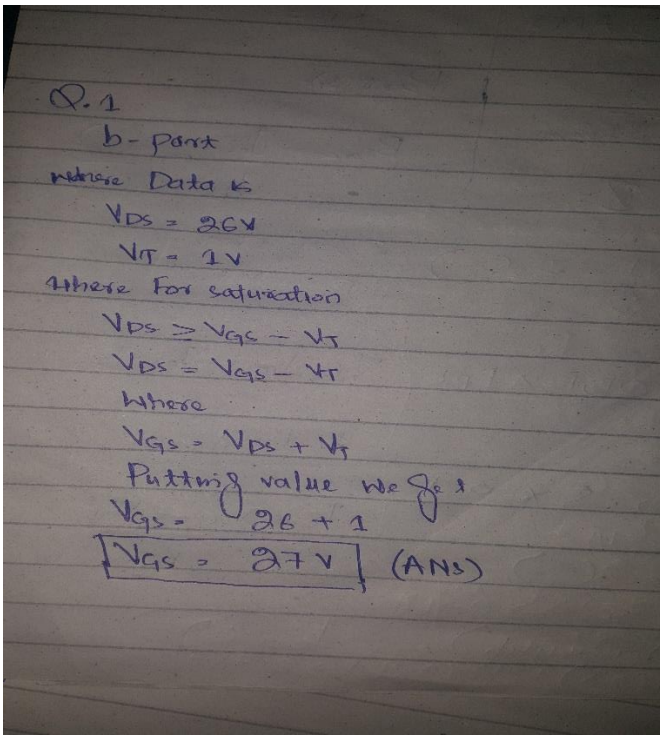
During positive cycle inductor store energy and during negative the inductor de energynize and cause damage the circuit .connected freewheeling diode during negative cycle create path by forward bias and current flow through diode and circuit save from any damage.

WAVEFORM of circuit



Conclude from RC circuit study when circuit is off condition the current decrease and become zero and freewheeling diode is used to provide path for decay current and where there is no decay current and so freewheeling diode is used in RC circuit and no impact

b) <u>part</u>



Question (2)

a) part

500 watts , 220 v ,500kHZ appliances where MOSFET replace with BJT what will its effects on his performance and losses and efficiency on appliance

- switching frequency will be lower of appliance because MOSFET have high switching frequency than BJT(performance base)
- losses will be low because losses in BJT is less than MOSFET loss in appliance will be low another reason (losses base)
- BJT cannot operate at high frequency one of the impact on performance (round about500kHZ)
- On state voltage low for BJT so the efficiency of the appliance improve
- Switching losses will increase due to BJT in appliance
- But conduction losses will be decrease because of BJT replacement in appliance
- on High frequency BJT are less efficient that also effect on its performance

The frequency of appliance is high and BJT have low frequency rate and switching frequency need to adjust frequency because frequency is so high

b) Part

The above is replace with SCR as switch and impact its performance , losses and efficiency is given below as

- SCR have no capabilities to handle high frequencies and will impact on its performance(appliance frequency in KHZ)
- SCR can handle more power ,voltage ,current which increase the efficiency of the appliance and one of the advantage(efficiency)
- SCR can protected because of the fuse which can decrease losses used as switch(performance of the appliance improve)
- SCR is allow adequate protection from heating and temperature which decrease the losses of the appliances
- They can only be switched from off to on with the gate. They switch off again if the current through them becomes zero. This is the one drawback and great impact on its performance
- SCR is the easy way to control the appliance which increase the efficiency of the above appliance
- One the great advantage of SCR is the cost which will decrease the cost for appliance used as switch (PTO)

The frequency of appliance is high and SCR have low frequency rate and switching frequency this is one of the main reason we need to overcome appliance requirement and properties and then SCR use as switch because above some properties of appliance (power and voltage can handle but frequency can,t handle .

QUESTION #3a on another page sir

Screenshot attached on another pages

Q.3 (a)

Data

$R_C \Rightarrow 26\Omega$

$V_{cc} = 026V$

$V_B = 10V$

$V_{CE} = 1V$

$V_{BE} = 1.5$

Find

(a) Mode of operation of transistor

(b) R_B

(c) B_{Force}

(d) Power losses P_T in the transistor

We know that

b) to Find R_B

$$I_{cs} = \frac{V_{cc} - V_{CE(sat)}}{R_C}$$

Putting value

$$= \frac{26 - 1}{26}$$

$$I_{cs} = \frac{25}{26} \Rightarrow 0.9A$$

$$I_{BS} = \frac{I_{cs}}{\beta_{F\,min}}$$

$$I_{BS} = \frac{0.9}{8}$$

$$I_{BS} = 0.1\,A$$

We know that

$$I_B = ODF \times I_{BS}$$
$$I_B = 5 \times 0.1$$
$$I_B = 0.5\,A$$

We know that

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

$$R_B = \frac{10 - 1.5}{0.5}$$

$$R_B = 17\,\Omega$$

Part (c)

$$B_{Force} = \frac{I_{cs}}{I_B} \Rightarrow \frac{0.9}{0.5} \Rightarrow 1.8A\,(B_{force})A$$

Part a)

$$P_T = V_{BE} I_B + V_{CE} I_C \quad — (1)$$

Putting value

$$P_T \Rightarrow (1.5)(0.5) + (1)(I_C)$$

We have to find I_C

We know that

$$V_{CE} = V_{CC} - I_C R_C$$

$$I_C R_C + V_{CE} = V_{CC}$$

Part (a)

~~Part (a)~~

[Transistor Switch]

$$I_C R_C = V_{CC} - V_{CE}$$

$$I_C = \frac{V_{CC} - V_{CE}}{R_C}$$

$$I_C = \frac{26 - 1}{26}$$

$$I_C = \frac{25}{26}$$

$$I_C = 0.9A$$

Putting equation (1) we get

$$P_T = (1.5)(0.5) + (1)(0.9) \Rightarrow 0.75 + 0.9 \Rightarrow 1.65 \text{ watt}$$