IQRA NATIONAL UNIVERSITY PESHAWER

Department OF Electrical Engineering

Name Hamza

ID 13042

Department Electrical

Paper Power ElectronicS

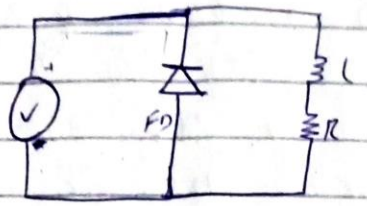
Name → Hamza ID → 13042

SUB → Power Electronics Submitted → Sir Shayan Tavakoli jan.

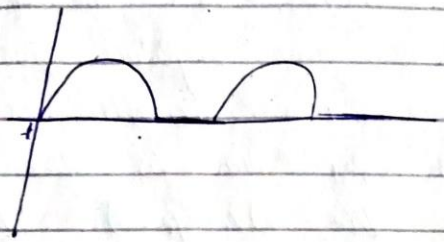
Q1 a (Part) An appliance circuit has a RL connected in series with a diode After some time modification is done to the circuit and a free-wheeling diode performance and output of the circuit. Back your answer with before and after data, bods and figures

Answer In case of RL without freewheeling diode voltage wave across the load has a positive and negative portion, the negative portion increases as load inductance increases (due to the current delay This reduces the Average DC voltage across the load. while when there is a freewheeling diode in parallel to the Ac voltage does not appear across the load, preventing the rectified voltage decrease.

In case of RL load is that the free wheeling diode cuts out negative part of the Ac voltage not to appear across the load terminals. Thus it prevents decreasing the value of the rectified DC voltage.



In negative Half cycle the diode will block it



→ Does adding a free wheeling diode in parallel to a RC circuit have the same effect, different effect or no effect?

If a capacitor is connected then by Ist half cycle the capacitor will charge to its max value.

As the other negative cycle start the current become reverse at that time the capicitor will provide the voltage and it will start discharging and it will give us the output again the 1st positive half cycle

will charge capacitor again.

B Part

Given data:

$V_{DS} = 42\,V$

$V_T = 2$

$G_{DS} = ?$

Solution:

we know that:

~~$V_{dg} = V_{gs} - V_t$~~

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

So

$\Rightarrow G_{DS} = V_{DS} + V_T$

$\Rightarrow G_{DS} = 42 + 2 = 44V$

$\boxed{G_{DS} = 44V}$ Ans

Q2
(a)
(Part)

Answer:

Following effect on Efficient and Losses.

EFFICIENCY: Mosfet is usually more efficient consume more power because its wasting current when it switches ON. Also the BJT generally has a 0.3v voltage drop in the input pin, and it takes a lot of base current to do that.

- Mosfet is more tolerant to heat
- It can simulate a good resistor.
- Mosfet is used for power supplies

LOSSES: losses due to BJT will be low and due to mosfet will be higher because mosfet is voltage control device and BJT is current control

B Part I

In case of Silicon

Silicon - Controlled Rectifiers:

An SCR is an acronym for Silicon-controlled rectifier and commonly referred to as a similar to a diode, which allows for current to flow in only one direction.

Mosfet:- The metal-oxide-semiconductor field-effect transistor (MOSFET) is a type of field-effect transistor (FET) most commonly fabricated by the controlled oxidation of silicon. It has an insulated gate, whose voltage determines the conductivity of devices.

Q3 Given data:

β_F range 8 to 40

$R_C = 42$

$V_{CC} = 042$

$V_B = 10$

$V_{CE} = 1V$

$V_{BE} = 1.5V$

Find

(a) Mode operation of the transistor

(b) The value of R_B that results in saturation with an ODF of 5.

(c) The β_{forced}

(d) The power loss, P_T in the transistor.

Answer (a) Mode operation of the transistor

The operation of transistor is in saturated mood.

(b) For RB we have: $RB = \frac{VB - VBE}{IB} \rightarrow (1)$

We know that, we have formula

$$ICS = \frac{Vcc - VCE}{RC}$$

$$ICS = \frac{042 - 1}{42}$$

$$\boxed{ICS = 0.976 \text{ Amp}}$$

Now we have,

$$IBS = \frac{ICS}{\beta min}$$

$$IBS = \frac{0.976}{8}$$

$$\boxed{IBS = 0.122 \text{ A}}$$

Now also find

$$IB = ODF \times IBS$$

$$IB = 5 \times 0.122$$

$$\boxed{IB = 061}$$

Now putting all values in eqn (1)

we get

$$R_B = \frac{10 - 1.5}{0.61}$$

$$\boxed{R_B = 13.93\ \Omega}$$

(B) $\beta_F = ?$

we know that,

$$\beta_f = \frac{I_{CS}}{I_B} = \frac{0.976}{0.61}$$

$$\boxed{\beta_f = 1.6}$$

(C) ~~$P_T = V_{BE}$~~ $P_T = ?$

$$P_T = V_{BE} I_B + V_{CE} I_{CS}$$

$$P_T = 1.5 \times 0.61 + 1 \times 0.976$$

$$P_T = 0.915 + 0.976$$

$$\boxed{P_T = 1.891\ W}$$ Ans

END