	COLLEGE OF COMPUTING AND INFORMATION SCIENCES		
	Final-Term Assessment Summer 2020 Semester		
Class Id	**104591**	**Course Title**	**Basic Electronics (B.E)**
Program	BSCS	**Campus / Shift**	Main Campus / Morning
Date	5th – August 2020	**Total Points**	**80**
Duration	**03 hours**	**Faculty Name**	**Faisal Ahmed**
Student Id	11122	**Student Name**	DANYAL IFTIKHAR

Instructions:

- Filling out Student-ID and Student-Name on exam header is mandatory.
- Do not remove or change any part of exam header or question paper.
- Write down your answers in given space or at the end of exam paper with proper title "Answer for Question# _ _".
- Answers should be formatted correctly (font size, alignment and etc)
- Only PDF format is accepted (Student are advise to install necessary software)
- In case of CHEATING, COPIED material or any unfair means would result in negative marking or ZERO.
- A mandatory recorded viva session will be conducted to ascertain the quality of answer scripts where deemed necessary.

- **Caution:** Duration to perform Final-Term Assessment is **03 hours only**. Extra 02 hours are given to cater all kinds of odds in submission of Answer-sheet. **Therefore, if you failed to upload answer sheet on LMS (in PDF format) within 05 hours limit, you would be considered as ABSENT/FAILED.**

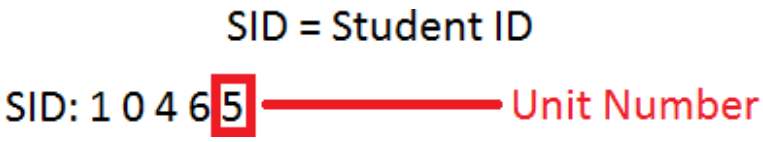
- **All answers are to be *HAND WRITTEN* if answers are written in text on word or other formatting software it won't be considered and marked.**
- **Only type values where asked.**
- **Write your Student ID on *TOP CENTER* of each and every page which should be clearly visible on which you are doing your solution, any page on which you miss writing your Student ID is not going to be marked. {In case you need to make any correction in your SID because of any reason you are not allowed use another page in that case and write clearly your SID on top center}.**
- **If for any reason your Student ID on any of your solution's Top Center page looks like edited, over written in that case your Midterm Exam will be awarded *ZERO SCORE***
- **If for what so ever reason *ANY OF YOUR SOLUTION'S ANSWER DOESN'T MATCH YOUR SOLUTION WORKING* in that case your whole solution will be considered bogus and in *ALL PARTS* of that particular question you will be given *ZERO MARKS.***
- **If for any reason you fail to follow instruction given for any question teacher reserves the right to award you zero score for that particular question.**
- **All answers are to be given in sequence.**

- **On every page below your Student ID, question which you are attempting its number should be written along with number of pages being used for that question.**
- **This exam contains total of 8 questions all of 10 points each on 09 pages, you are required to attempt all of them.**

Q1) Using ***node voltage analysis*** find the voltage and current across Resistor R3 for the circuit given in *figure 1*.

(

10 Points)



Condition	**Instruction**
If Unit Number of Your SID is 0, 2, 4, 6	Make node equations according to Green current arrows
If Unit Number of Your SID is 1, 5, 8	Make Node Equations according to Red current arrows
If Unit Number of Your SID is 7, 3, 9	Make Node Equations according to Blue current arrows

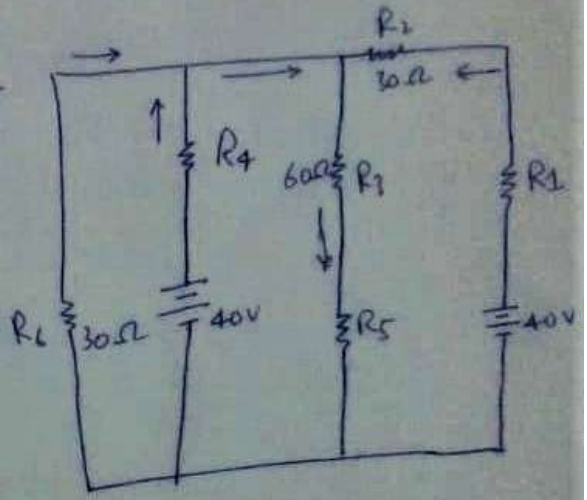
Table Number 1

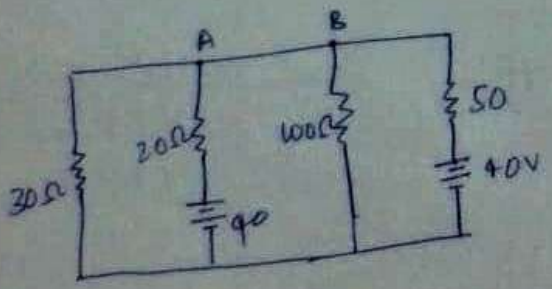
Paste Your Solution Here:

QNo:1

→ Node Voltage Analysis

→ Converting R_3 and R_5 in one resistor R_7 and R_2 & R in R_8 ↓



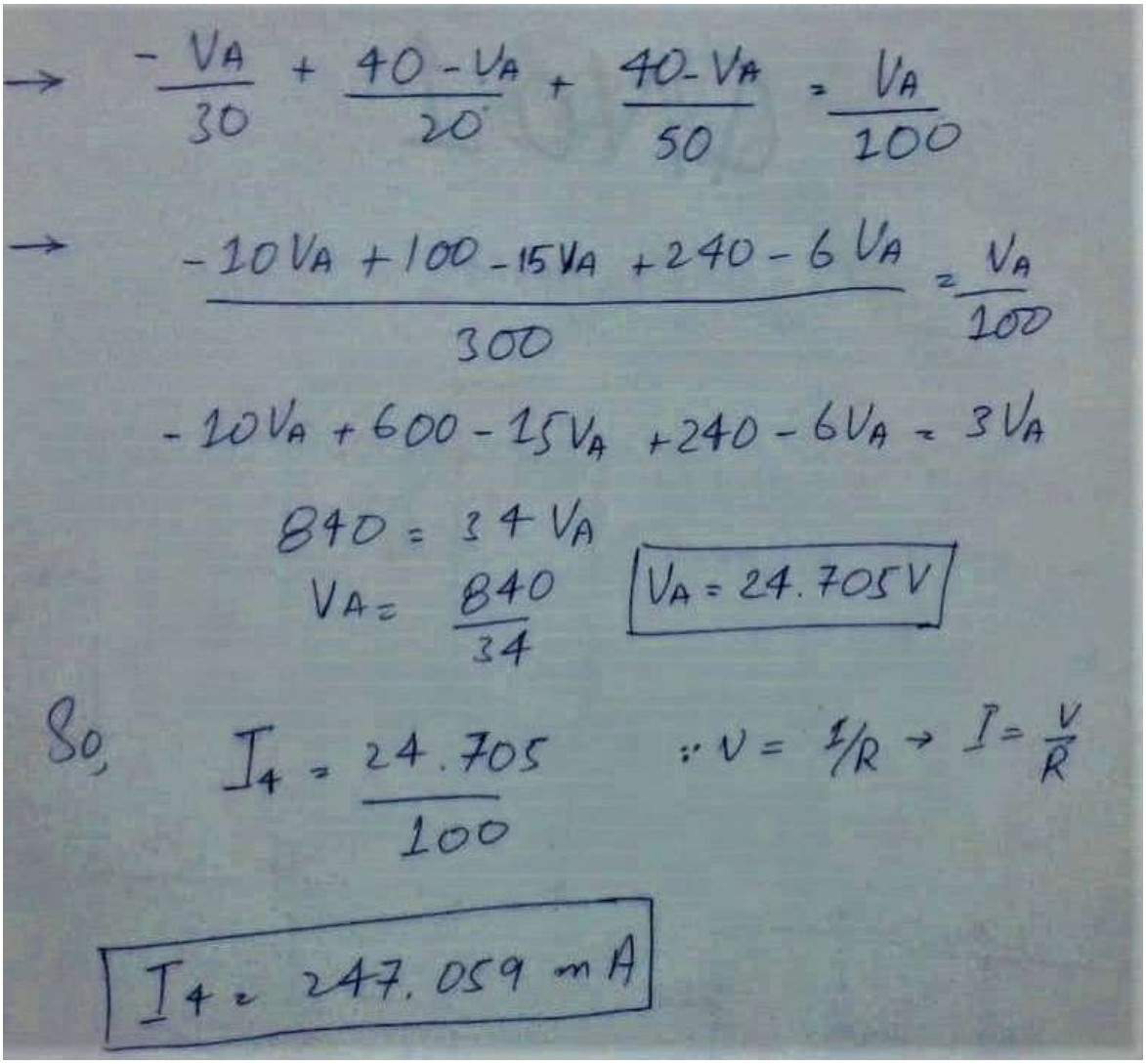


⇒ Node A

$$I_2 + I_1 + I_5 = I_4$$

(Entering current) (leaving current)

$$\frac{0 - V_A}{30} + \frac{40 - V_A}{20} + \frac{40 - V_A}{50} = \frac{V_A - 0}{100}$$



Q2) For the circuit given in *figure 2.* find the Thevenin Equivalent circuit and value for V_L and I_L if R_L = 2000Ω and V = 25 voits. **(10 Points)**

R = SID =11122

R = SID / 2 =5561

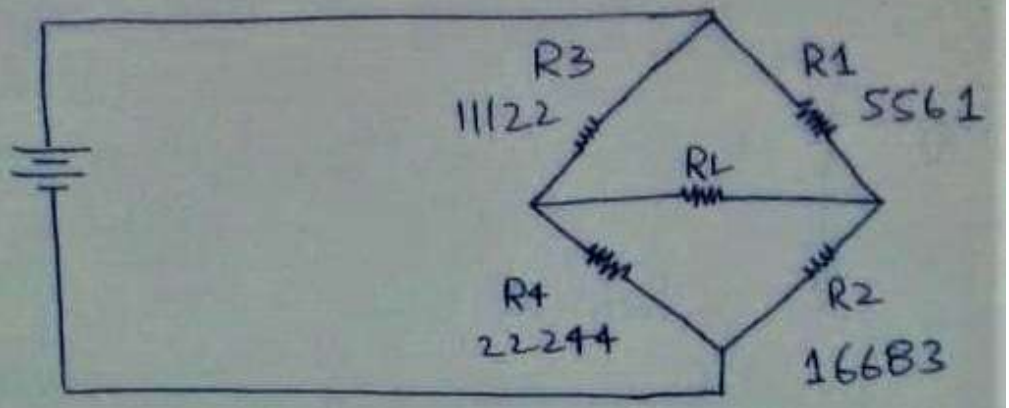
R = 2 * SID =22244

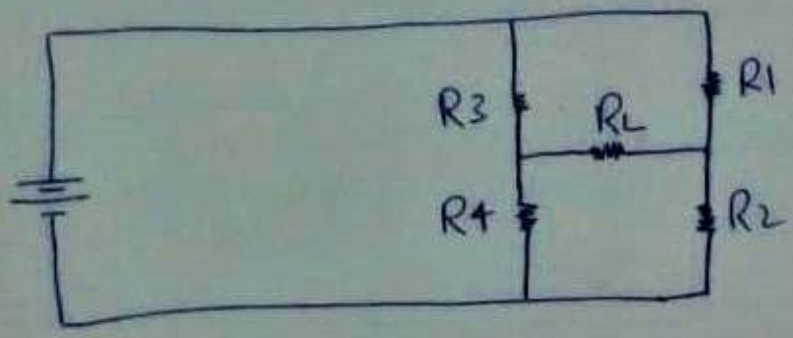
R = 1.5 * SID =16683

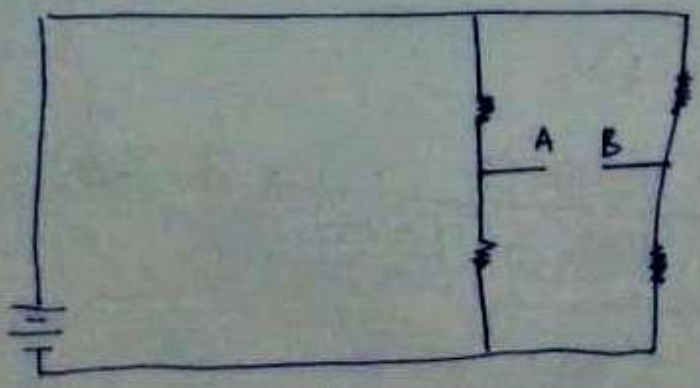
Write values in given blank spaces ***SID: 11122***

Paste Your Solution Here:

QNO:2







From Voltage Divider

$$V_{R3} = \frac{R_3}{R_3 + R_4} \times V_T = \frac{11122}{11122 + 22244} \times 25$$

$$\boxed{V_{R3} = 8.33 \text{ Volts}}$$

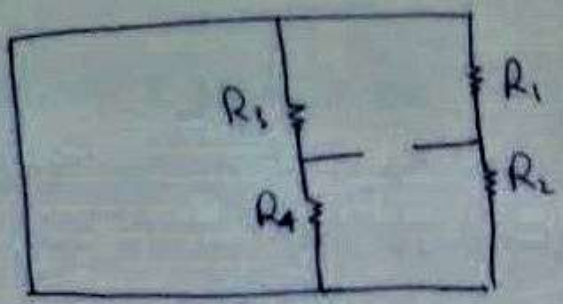
$$V_{R1} = \frac{R_1}{R_1 + R_2} \times V_T$$

$$= \frac{5561}{5561 + 16683} \times 25$$

$$\boxed{V_{R_1} = 0.25V}$$

$$V_{TH} = V_{R3} - V_{R1} = 8.33 - 0.25$$

$$\boxed{V_{TH} = 8.08}$$



R_3 and R_4 are in parallel

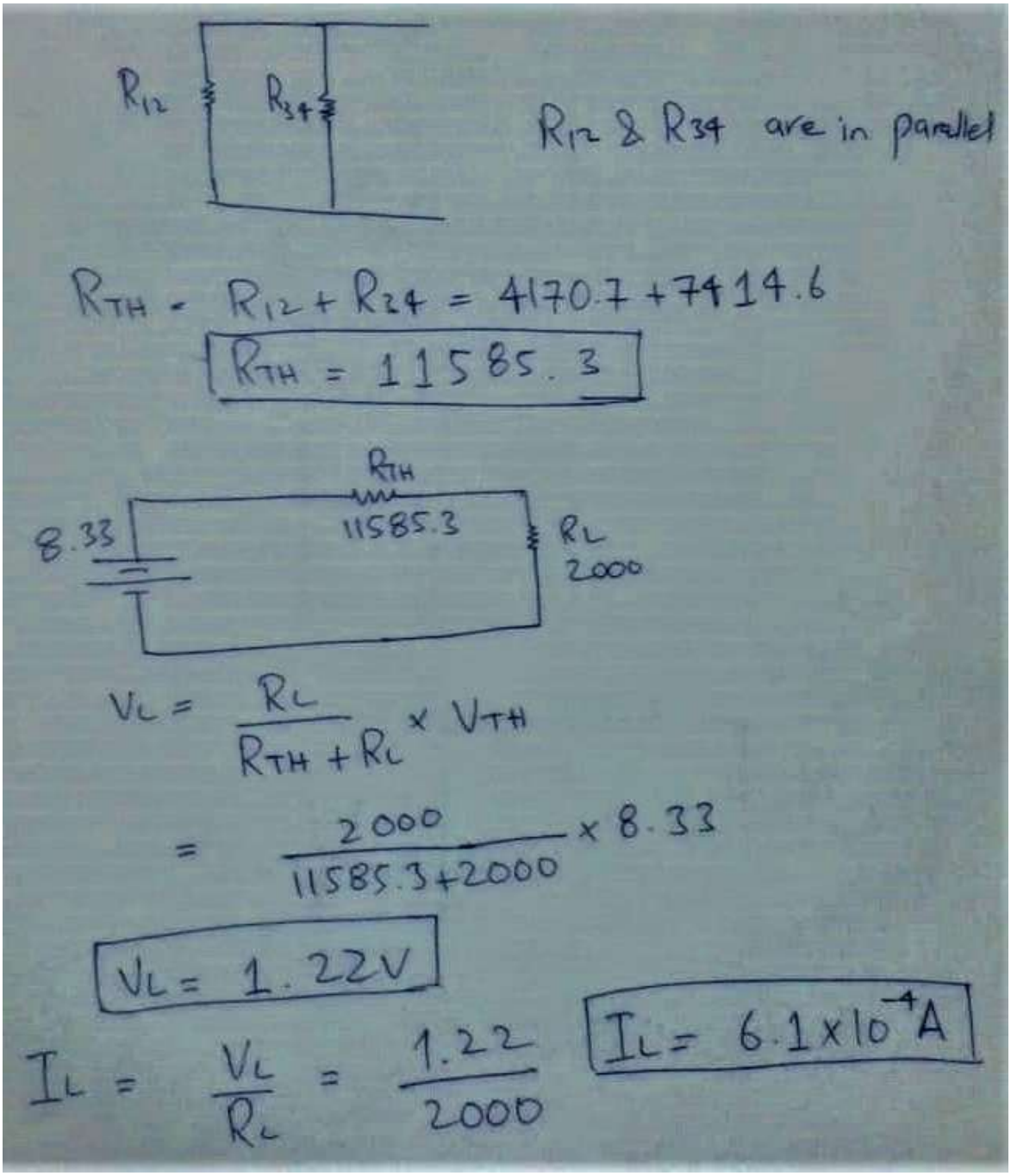
$$R_{34} = \frac{R_3 \times R_4}{R_3 + R_4} = \frac{11122 \times 22244}{11122 + 22244}$$

$$\boxed{R_{34} = 7414.6}$$

R_1 and R_2 are in parallel

$$R_{12} = \frac{R_1 \times R_2}{R_1 + R_2} = \frac{5561 \times 16683}{5561 + 16683}$$

$$\boxed{R_{12} = 4170.7}$$



Q3) Answer the following according to the condition given. **(10 Points)**

Condit ion	Questi ons

If Unit Number of Your SID is 0, 2, 4, 6	• Explain with the help of diagram how Bypass Capacitor works • If a certain capacitor has a value of 20µF and AC signal applied to it has frequency of 2 MHz find its reactance.
If Unit Number of Your SID is 1, 5, 8	• Explain working for Capacitive Coupling • Explain working of LOW PASS FILTER
If Unit Number of Your SID is 7, 3, 9	• Explain working for transformer coupling • Explain working of HIGH PASS FILTER

Table Number 2

Paste Your Solution Here:

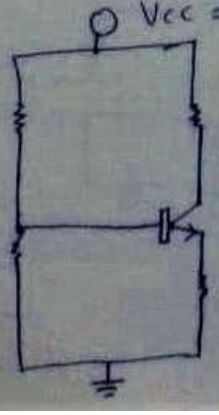
Q NO: 3

(a) Bypass Capacitor

The bypass capacitor is a capacitor ~~that~~ ~~shows~~ shorts AC signals to ground, so ~~that~~ any AC noise ~~that~~ may be present on a DC signal is removed, producing a much cleaner and pure DC signal.

A bypass capacitor essentially bypasses AC noise ~~that~~ may be on a DC signal, filtering out the AC, so ~~that~~ a clean, pure DC signal goes through without ~~and~~ any AC ripple.

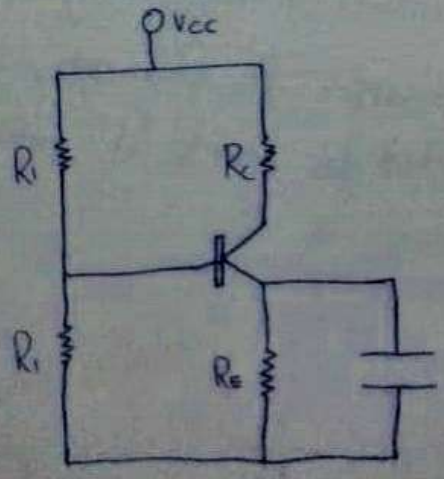
A transistor circuit: A transistor is an active device, so in order to work, it needs DC power. This power source is Vcc

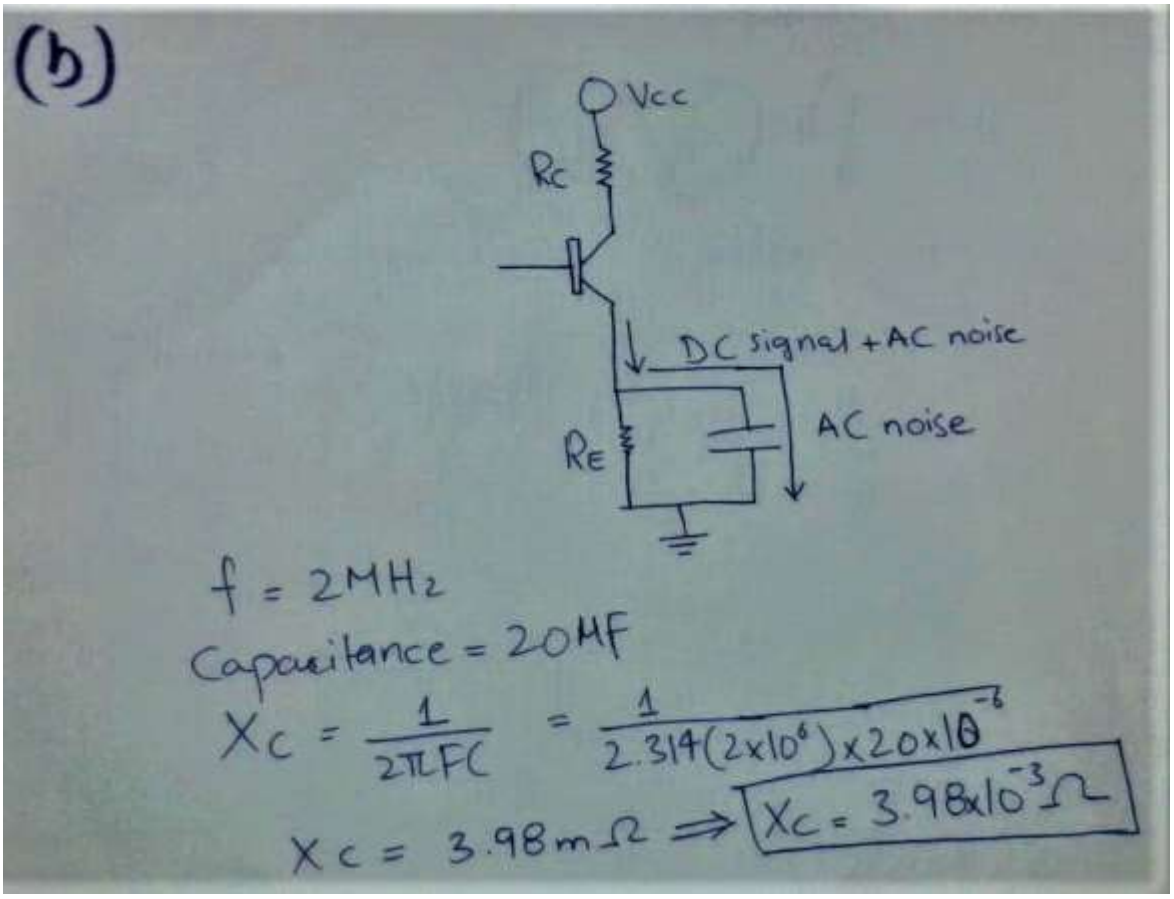


A DC signal such as this actually very common. This is undesired because it adds noise to the transistor circuit. Therefore, the noisy DC signal will be imposed on the DC signal. So the AC signal which may have music or some type of recording will now have much more noise.

This noise which is on the signal is AC ripple. Many times when using DC power supply connected to an AC power outlet, it will have some of the AC noise transfer to the DC power voltage. AC ripple can also appear from other sources.

To eliminate this AC ripple we use a bypass capacitor. So our transistor circuit will have a bypass capacitor added to it:





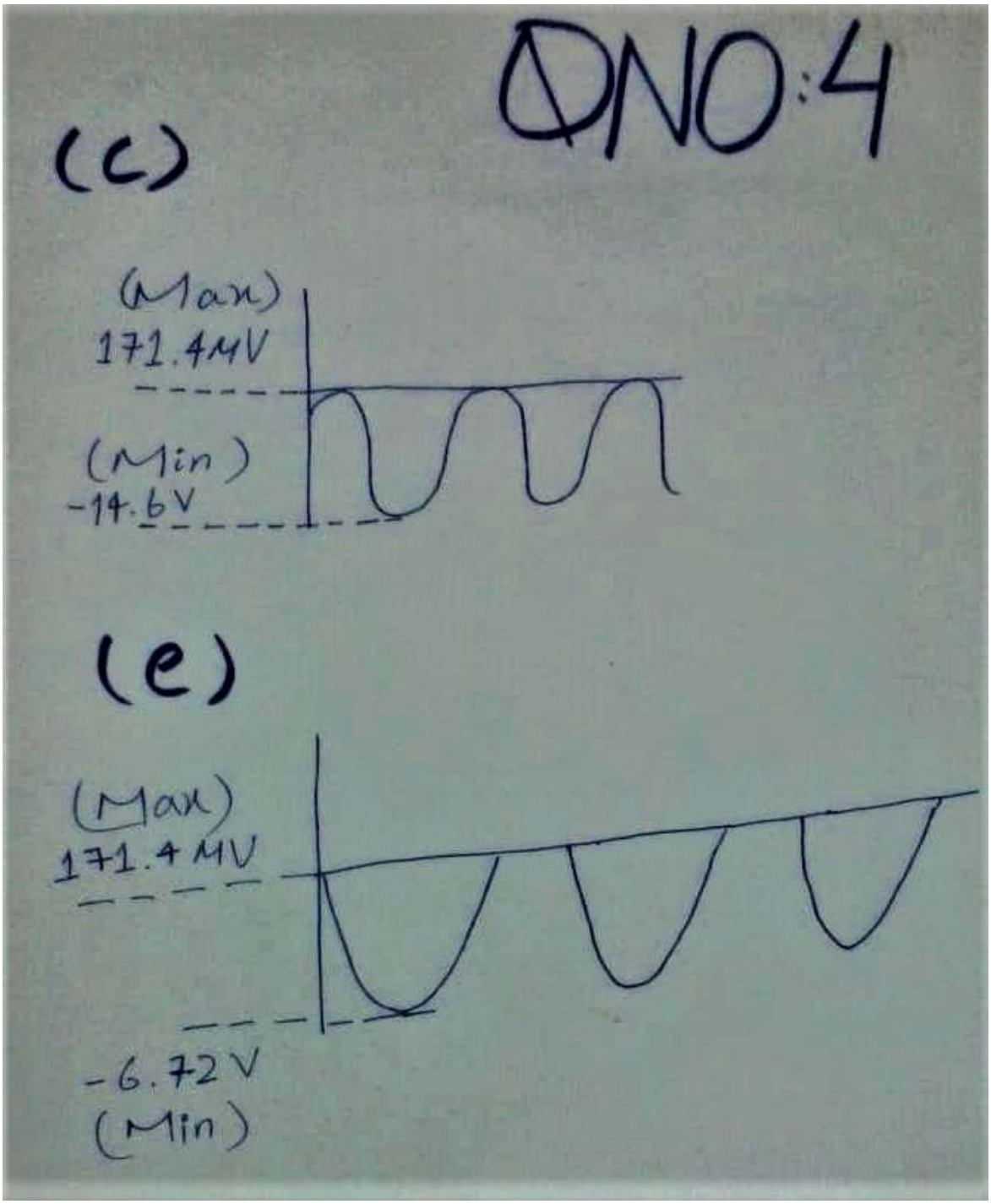
Q4) For the circuits given below in *figure 3* draw the output waveform ***according to the given condition.*** **(10 Points)**

Condition	Questions
If Unit Number of Your SID is 0, 4, 1	Draw Output Wave Form for ***PART (a) and (f) ONLY*** mentioning maximum and minimum voltage level. **(Show Your Working)**
If Unit Number of Your SID is 6, 8, 3	Draw Output Wave Form for ***PART (b) and (d) ONLY*** mentioning maximum and minimum voltage level. **(Show Your Working)**
If Unit Number of Your SID is 7, 5, 9, 2	Draw Output Wave Form for ***PART (c) and (e) ONLY*** mentioning maximum and

	minimum voltage level. **(Show Your Working)**

Table Number 3

Paste Your Solution Here:



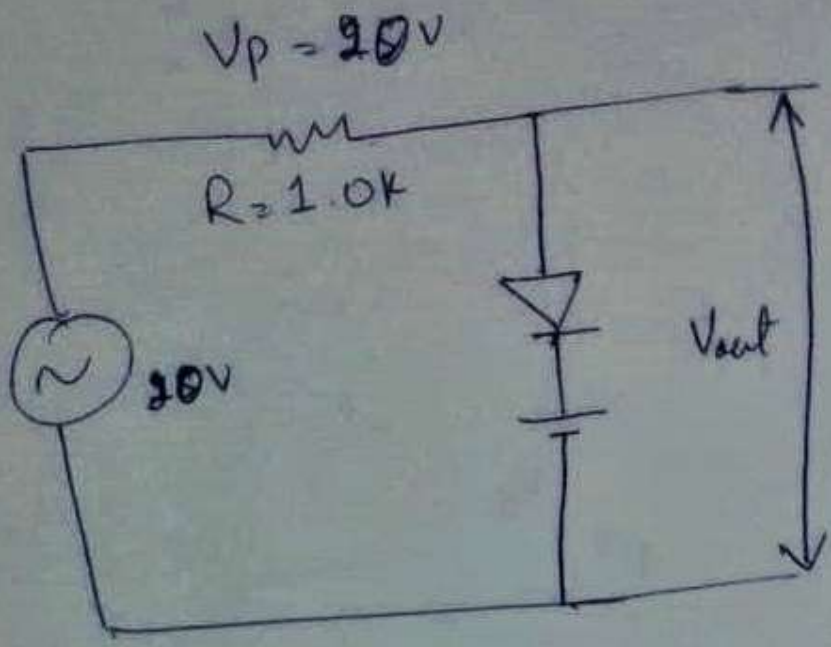
Q5) For *figure 4* draw the corresponding diode limiter circuit which will produce output wave as given. **(10 Points)**

Condition	Questions
If Unit Number of Your SID is 0, 4, 1	Draw the circuit which will produce output as given in **Part (A) ONLY.** Input sine wave voltage has peak value of 15 Volts
If Unit Number of Your SID is 6, 8, 3	Draw the circuit which will produce output as given in **Part (B) ONLY.** Input sine wave has a peak value of 15 Volts
If Unit Number of Your SID is 7, 5, 2, 9	Draw the circuit which will produce output as given in **Part (C) ONLY.** Input sine wave has a peak value of 20 V and let X = 10 V.

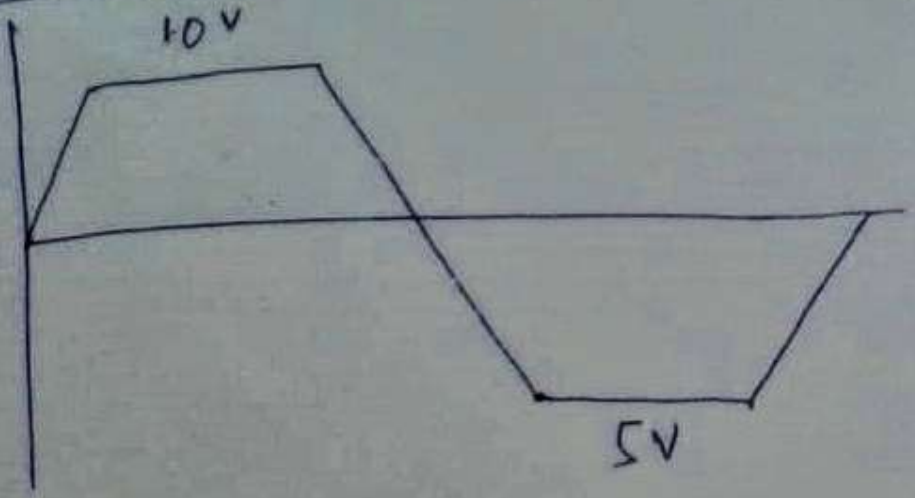
Table Number 4

Paste Your Solution Here:

QNO:5



OUTPUT:



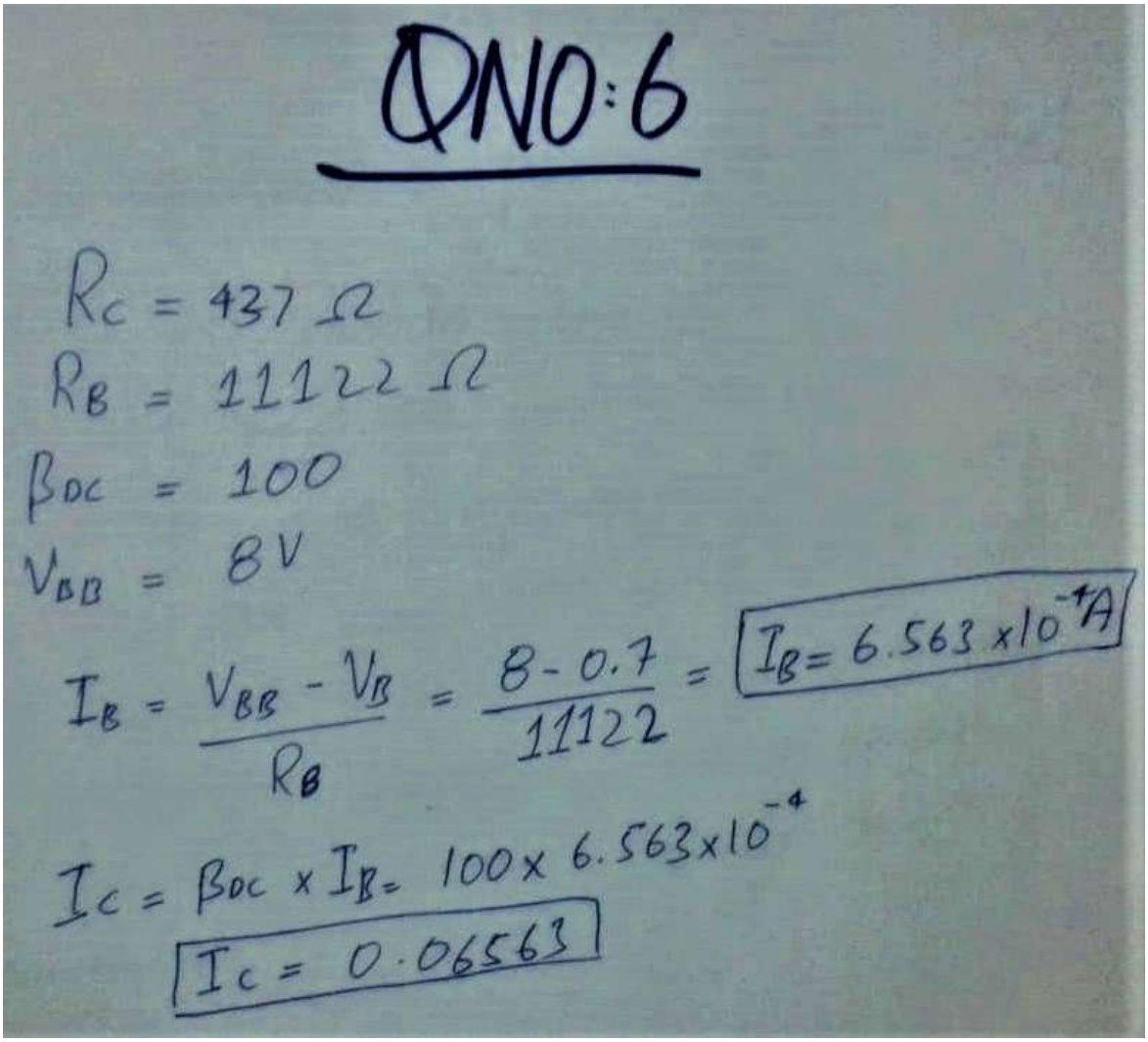
Q6) For the circuit given in *figure 5* find the following according to the given conditions in table. **(10 Points)**

Condition	Questions
If Unit Number of Your SID is 6, 4, 1	For circuit given above consider. R_C = 384 Ohms R_B = Your SID in Ohms β_{DC} = 200 V_{BB} = 5 V • Check if this transistor is in saturation or not • If this transistor is in saturation suggest the minimum value of R_B for which this transistor will be in active region. Otherwise • If this is in active region you may draw its DC load line.
If Unit Number of Your SID is 0, 5, 8, 3	For circuit given above consider. R_C = 644 Ohms R_B = Your SID in Ohms β_{DC} = 150 V_{BB} = 4 V • Check if this transistor is in saturation or not • If this transistor is in saturation suggest the minimum value of R_B for which this transistor will be in active region. Otherwise • If this is already in active region you may draw its DC load line.
If Unit Number of Your SID is 7, 2, 9	For circuit given above consider. R_C = 437 Ohms R_B = Your SID In Ohms β_{DC} = 100 V_{BB} = 8 V • Check if this transistor is in saturation or not • If this transistor is in saturation suggest the minimum value of R_B for which this transistor will be in active region. Otherwise

	• If this is in active region you may draw its DC load line.

Table Number 5

Paste Your Solution Here:



Q7) In the following question are required to draw the circuits and write descriptive answers.

(10 Points)

SID Condition	Questions	Values

SID UNIT Number 1,2,3,4	• Generalized r-parameter AC model of BJT & explain it. • Calculate the value of current source in it, use α_{ac} = 0.92 • Calculate the value of Ac (Internal) emitter resistance.	**I_E = 1.5m A**
SID UNIT Number 5,6,7	• Multistage Amplifier with 2 Common Emitter Amplifier & 1 Common Collector Amplifier • Explain Phase inversion of Common Emitter Amplifier • Calculate Voltage Gain if RC = 350 Ω and RL = your S.id (in ohms)	**I_E = 2.5m A**
SID UNIT Number 8,9,0	• Simplified r-parameter AC model of BJT & Explain the simplification. • Calculate the value of current source in it, use α_{ac} = 0.85 • Calculate the value of AC (Internal) emitter resistance.	**I_E = 2.2m A**

Table Number 6

Paste Your Solution Here:

QNO:7

a) Simplified r-parameter AC model

In the AC domain operation is quite different and the transistor works in the linear operating region. The r model reflects the operation of the BJT at mid-frequency and is sufficiently accurate The r_e model is an equivalent circuit that can be used to predict the performance.

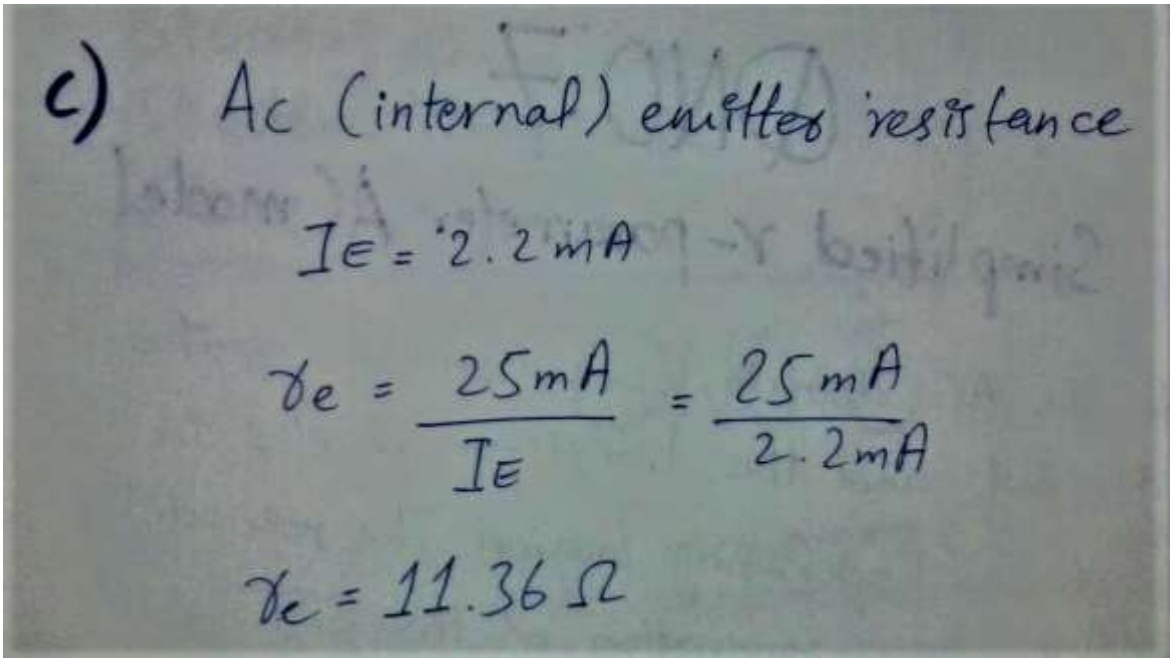
b) $I_E = 2.2\,mA$

$\alpha_{ac} = 0.85$

$I = \alpha_{ac} \times I_E$

$I = (2.2)(0.85)$

$I = 1.87$



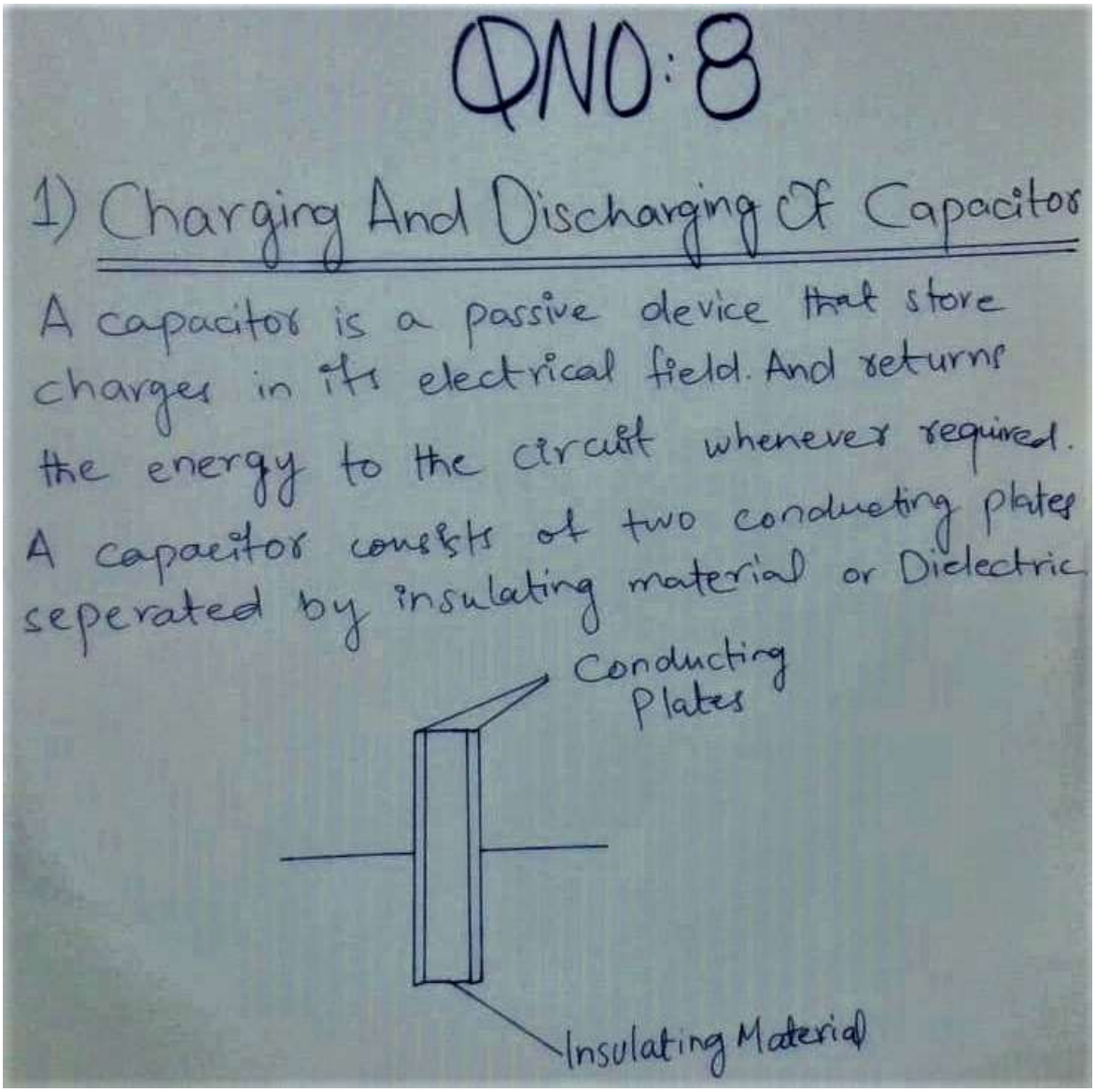
Q8) Write in your own words **any 5 from your SID group**, all carry equal marks. (10 Points)

Even SIDs ending with 0,2,4,6,8	ODD SIDs ending with 1,3,5,7,9
• **1)** Explain charging and discharging process of a capacitor	• **7)** Draw equivalent circuit diagrams for complete diode model and explain it.
• **2)** Explain the importance of PIV of a diode for connecting it in a circuit.	• Draw diode's characteristic curve and explain reverse breakdown.
• **3)** Explain the role of Forbidden energy band in Insulator and Semiconductor.	• **9)** Explain why electrons in conductor even after being in conduction band don't result in current
• **4)** Explain the formation of PN junction with the help of diagrams	• **10)** Explain the difference between N type and P type semiconductor using Energy Band Diagram
• **5)** Explain formation of N type Semiconductor	• **11)** Explain formation of P type Semiconductor
• **6)** In which conditions should	• **12)** How bridge rectifier is

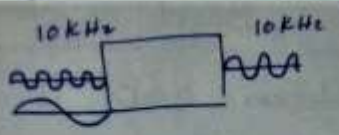
we use Ideal, practical and complete diode models	more capable then center tapped rectifier

Table Number 7

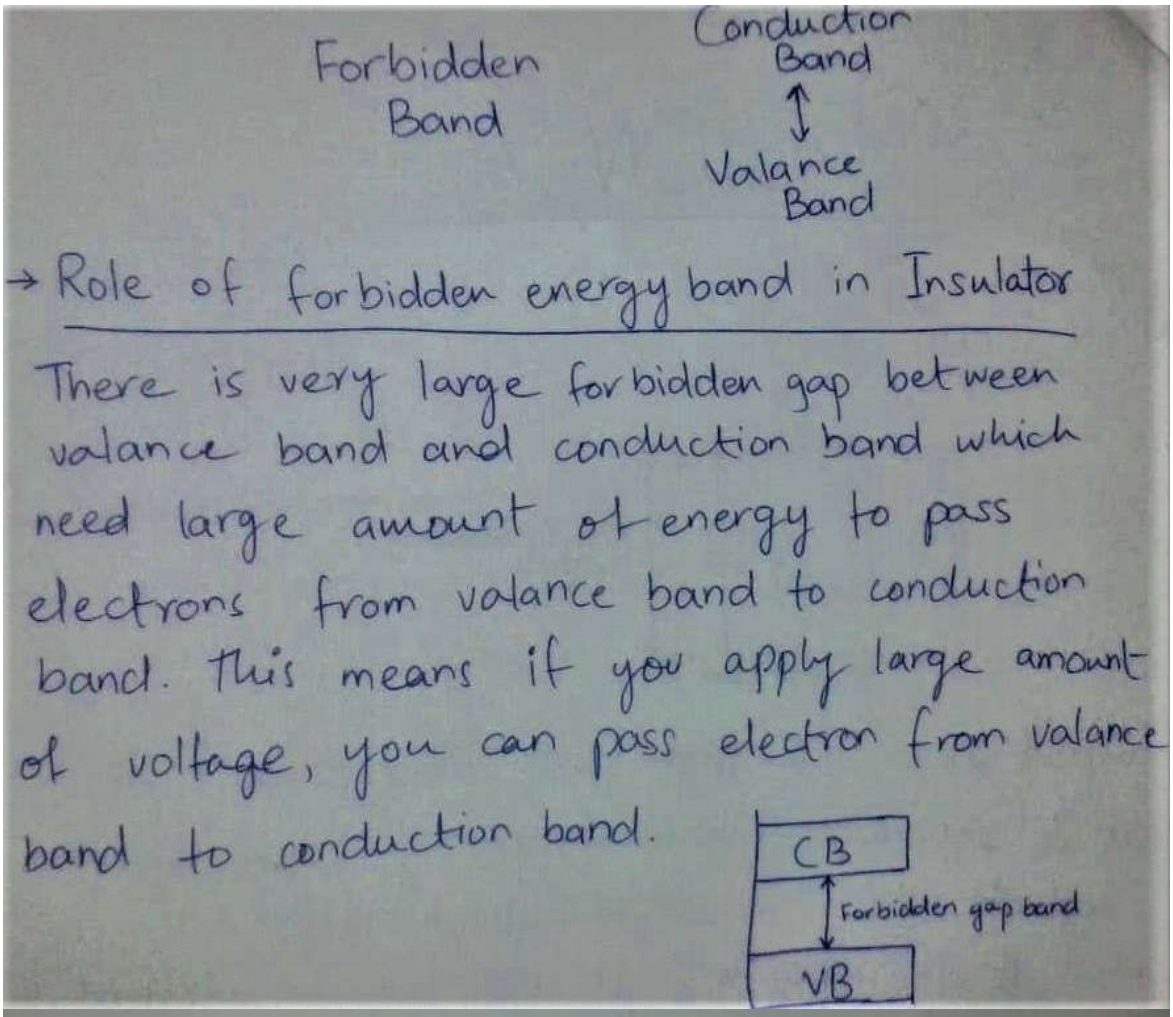
Paste Your Solution Here:



When a capacitor is connected to a circuit with Direct Current (DC) soure, two processes which are called "charing" and "discharging" the capacitor, will happen in specific condition.



c) Forbidden band seperates conduction band and valance band. It is energy required by electron to jump from valance band to conduction band.



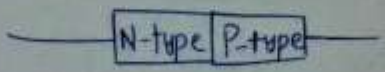
→ Role of forbidden energy band in Insulator

There is very large forbidden gap between valance band and conduction band which need large amount of energy to pass electrons from valance band to conduction band. This means if you apply large amount of voltage, you can pass electron from valance band to conduction band.

→ Role of Forbidden Energy Band in Semi-conductor

Semi-conductor forbidden gap is very small which allow electrons to move from valance band to conduction band with less energy.

d) PN Junction



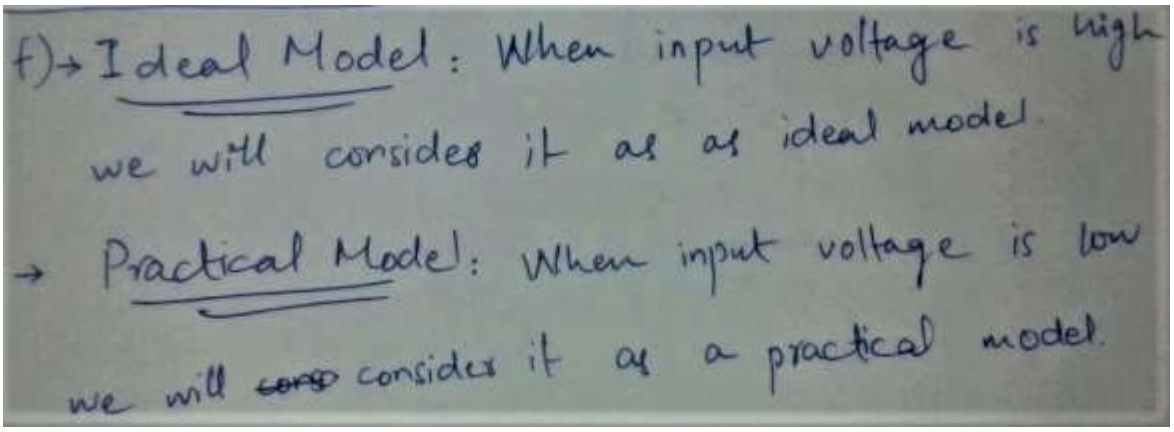
N-Type consist of more electrons than P-Type which will jump to P-Type region.
N-Type and P-Type electrons will form a region where charge will get seperated and basically this is called PN-Junction

e) Formation of N-Type Semi-conductor

N-Type semi-conductor is formed by doping of penta valent impurity. In N-Type semi-conductor the atom of penta valent impurity will be between silicon atoms

→ Complete Diode Model

This model is more accurate to use because it includes diode reverse resista a small amount of reverse current that's why it is more approximate.



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