KLS Vishwanathrao Deshpande Institute of Technology

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

University / Model Question Paper Scheme & Solution

Faculty Name	:	Prof. Nikhil A. Kulkarni
Course Name	:	Basic Electronics
Course Code	:	BBEE103
Year of Question Paper	:	JUNE/JULY 2023
Date of Submission	:	28.11.2023

Faculty Member

HoD

Dean (Acad.)

Head of the Department
Dept. of Electronic & Communication Engg.
KLS V.D.I.T., HALIYAL (U.K.)

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CBCS SCHEME

USN | | | | | | | | | | |

BBEE103/203

First/Second Semester B.E./B.Tech. Degree Examination, June/July 2023
Basic Electronics for EEE Stream

Time: 3 hrs. Max. Marks: 100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. M : Marks , L: Bloom's level , C: Course outcomes.
3. Assume missed data.

		Module – 1	M	L	C
Q.1	a.	Explain forward and reverse characteristics of semiconductor diode.	8	L2	CO1
	b.	Calculate forward and reverse resistances offered by a silicon diode with I_f = 100mA at V_R = 50V. Assume V_F for silicon diode to be 0.75V and reverse current $I_R \simeq 100nA$.	4	L3	CO1
	c.	What is piecewise linear characteristic? With neat diagram explain diode approximation of Ideal diode and practical diode.	8	L2	CO1
		OR			
Q.2	a.	Describe the working of full wave bridge rectifier.	8	L2	CO1
	b.	Explain zener diode as voltage regulator with no load and with load.	6	L2	CO1
	c.	Illustrate RC- π filter.	6	L2	CO1
		Module – 2			
Q.3	a.	Explain output characteristics of a transistor in common base configuration.	6	L2	CO2
	b.	Describe the procedure for drawing dc – load line on transistor CE output characteristics.	8	L2	CO2
	c.	Calculate I_c and I_E for a transistor that has α_{DC} = 0.98, I_B = 100μA. Also determine the value of β_{DC} for the transistor.	6	L3	CO2
		OR			
Q.4	a.	Explain common Emitter input characteristics.	6	L2	CO2
	b.	Explain how transistor can be used as current amplifier.	6	L2	CO2
	c.	Explain the working of N-channel JFET.	8	L2	CO2

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		Module – 3			
Q.5	a.	Explain Inverting and Non-inverting amplifier.	8	L2	CO2
	b.	Define Op-Amp. Mention any 5 ideal characteristics of an op-amp.	6	L2	CO2
	c.	Draw a summer circuit with $V_1 = +1V$, $V_2 = +3V$, $V_3 = +2V$, $R_1 = R_2 = R_3 = 2K\Omega$. Determine the output voltage when $R_F = 3K\Omega$.	6	L3	CO2
		OR			
Q.6	a.	Explain the working of op-amp as Differentiator.	8	L2	CO2
	b.	Define : i) Input offset current ii) Input bias current iii) slew rate iv) CMRR	6	L2	CO2
	c.	With block diagram, explain basic structure of an Op amp. Also write its equivalent circuit diagram.	6	L2	CO2
		Module – 4			
Q.7	a.	Convert the following : i) $(2AB.8)_{16} = (\ )_{10}$ ii) $(416.12)_{10} = (\ )_8$ iii) $(25.375)_{10} = (\ )_2$ iv) $(16.2)_8 = (\ )_{16}$	6	L2	CO3
	b.	Find complement of the function i) $F_1 = x'yz' + x'y'z$ ii) $F_2 = x(y'z' + yz)$ Using De-Morgan's theorem.	8	L2	CO3
	c.	Explain the working of Half adder.	6	L2	CO3
		OR			
Q.8	a.	Express the Boolean function $F = A + B'C$ in sum of minterms.	6	L3	CO3
	b.	Mention the postulates and theorems of Boolean algebra.	8	L2	CO3
	c.	Explain the working of full adder.	6	L2	CO3
		Module – 5			
Q.9	a.	Describe the working of LVDT.	6	L2	CO4
	b.	Explain the working principle of capacitive pressure transducer.	6	L2	CO4
	c.	With neat block diagram, explain the working of communication system.	8	L2	CO4
		OR			
Q.10	a.	Describe a Thermistor and sketch approximate resistance/temperature characteristics for a thermistor.	6	L2	CO1
	b.	Write a short notes of photo diodes	6	L2	CO5
	c.	What is modulation? Describe the need of modulation in communication system.	8	L2	CO5

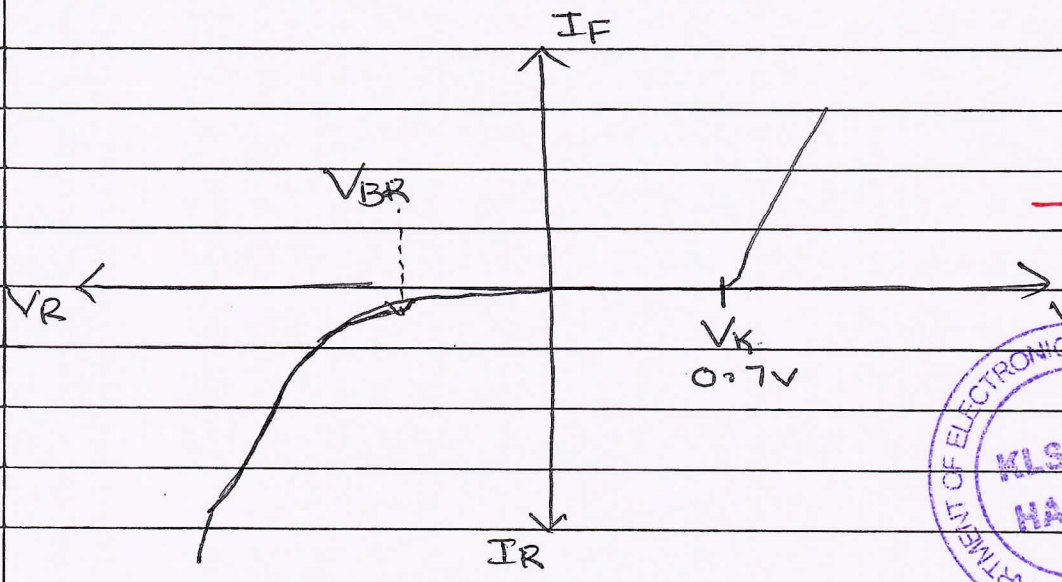
Topic : Basic Electronics June/July 2023 Module-1

Date : .....

Page No. (1)

Q1A) Explain V-I characteristics of a PN Junction Diode for both forward and reverse characteristics — 8M

Sol:- Let us consider Silicon diode, following figure shows the Forward and Reverse characteristics



— 2M

Fig 1a: Forward and Reverse characteristics of Si Diode

In Fig 1a

V_F and I_F are the Forward cond Voltage and Forward current which ase applied across the drode and flowing through the diode respectively

V_R and I_R are the Reverse voltage applied across the diode during reverse bias and I_R is the reverse current flowing through the diode

2M

V_K : It is the knee voltage, which will be 0.7V for Si diode and 0.3V for Ge diode. It is the forward voltage at which current flows through the diode during forward bias condition

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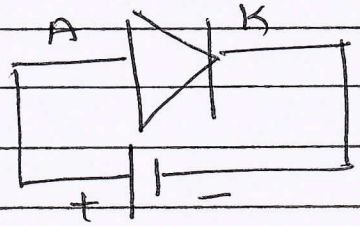
V_{BR}: It is the reverse breakdown voltage, i.e. It is the reverse voltage at which PN Junction breaks and a large reverse current flows through the diode, typical values are -75V for Si and -50V for Ge 2M

Forward Bias: A Diode is said to be forward biased if the Anode (P-Type) is more +ve than the Cathode (N-type)



2M

Reverse Bias: A Diode is said to be reverse biased if the Anode (P-Type) is less positive or -ve with Cathode (N-Type)

Q.1b) Given: $I_f = 100mA$ @ $V_R = 50V$, $V_F = 0.75V$
$I_R = 100nA$. 4M

$R_F = \frac{V_F}{I_F} = \frac{0.75V}{100mA} = 7.5\Omega$ | $R_R = \frac{V_R}{I_R} = \frac{50V}{100nA} = 500M\Omega$

2M 2M

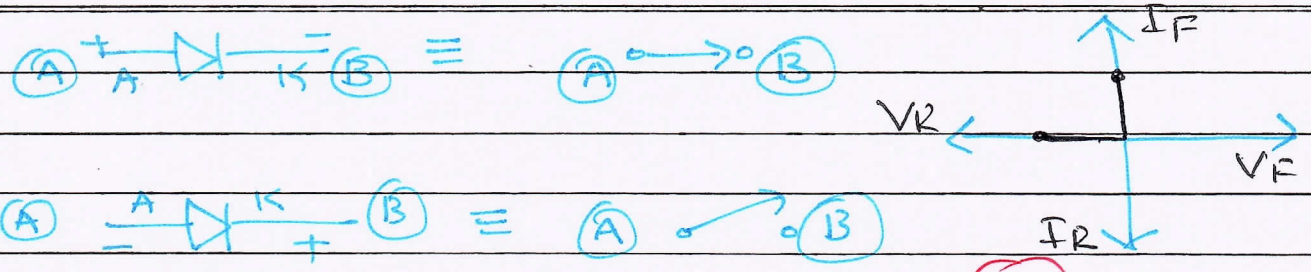
Q.1c) Diode Approximations 8M

There are 3 Approximations

1) Ideal Diode Approximation: It is the ideal approximation in which Diode is represented by closed switch in Forward Bias condition and open switch in Reverse condition

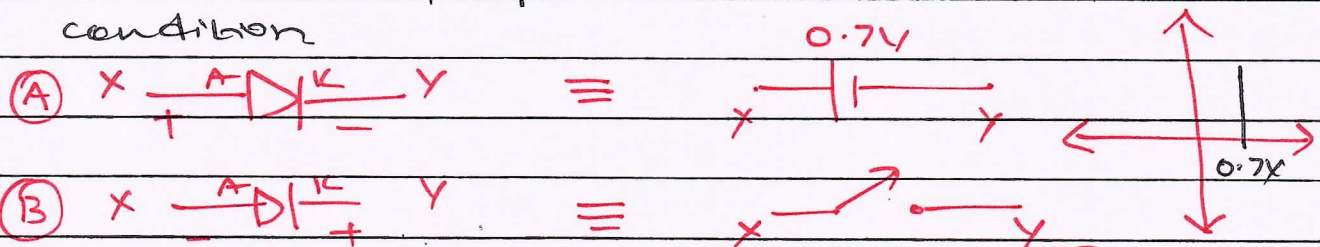
Teacher's Sign.

Q1c)



2M

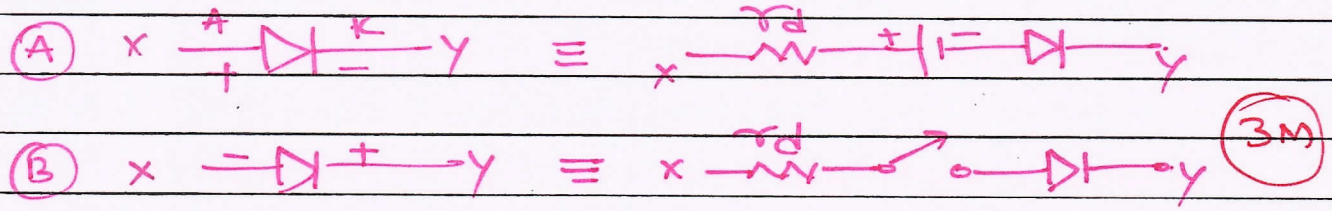
2) DC Equivalent Ckt: In this diode is replaced by its equivalent knee voltage during forward bias and by open ckt by reverse bias condition



3M

3) Piecewise Linear Characteristics

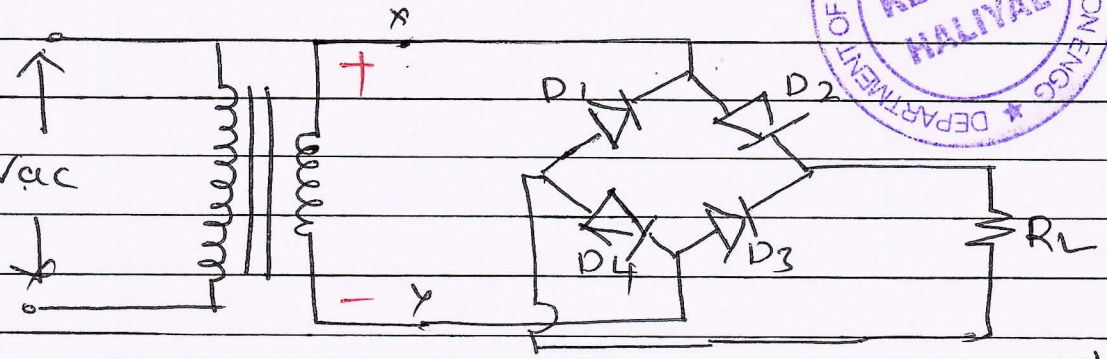
In this along with the knee voltage, the forward resistance or dynamic resistance is also included in the representation



3M

Q2a) Working of Full Wave Bridge Rectifier: 8M

Circuit Diagram: It uses 4 diodes for rectification process.



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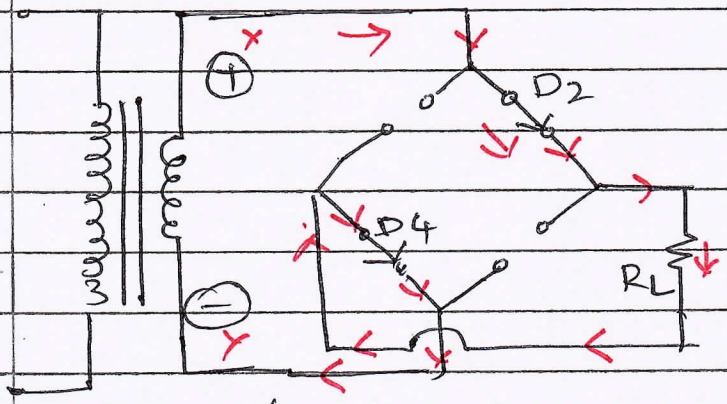
During +ve half of the input signal, point-x will be +ve w.r.t- y, hence Diode D_2 and D_4 will be forward biased whereas Diode D_1 and D_3 will be reverse biased, hence current flows through x - D_2 - R_L - D_4 - y as shown below, Similarly During -ve half of i/p x will be -ve w.r.t- y, hence conduction takes place from y - D_3 - R_L - D_1 - x.

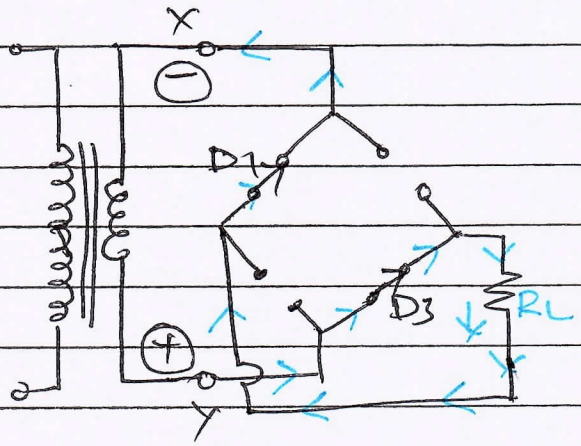
4M11

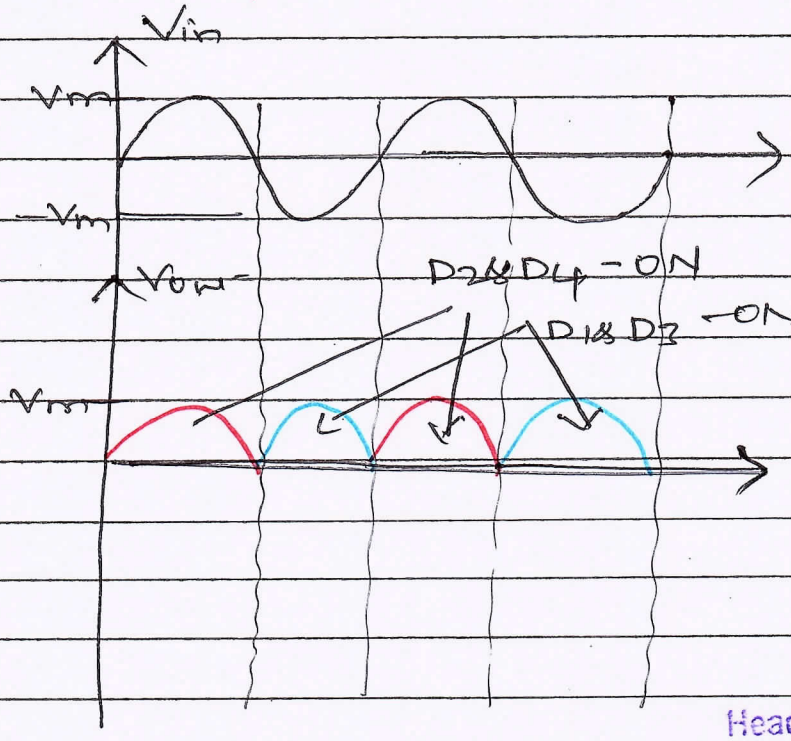
During +ve half cycle



4M11

During -ve half cycle





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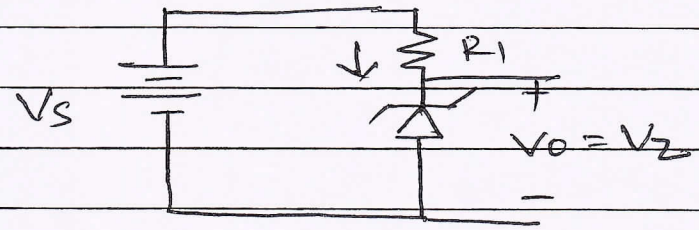
Q2b) → Zener Diode as a voltage Regulator! (6M)

Zener Diode is used to maintain a constant DC O/p voltage in ckts like rectifiers

→ Consider the ckt with no load

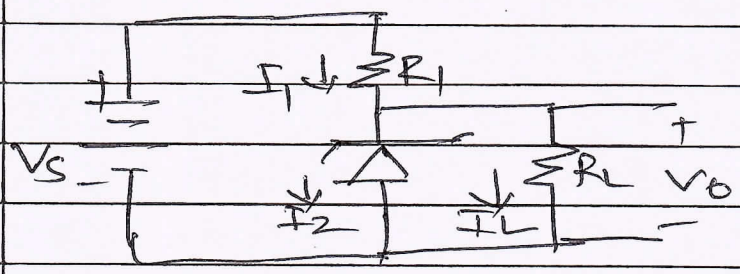


$$I_z = \frac{V_s - V_z}{R_1} \quad \text{--- (1)}$$

3M

From Eq① (1) we can understand that V_z depends on $(I_z \times R_1)/V_s$, if V_s is greater than V_z then V_z remains constant but I_z increases. ($V_o = V_z$)

→ Consider the ckt with load



Here,

$$I_z + I_L = I_1$$

$$I_z + I_L = \frac{V_s - V_z}{R_1} \quad \text{--- (2)}$$

3M

From Eq② (2), we can conclude that I_z is $= I_1 - I_L$, again if current through zener is more then current through R_L will be less such that $V_o = V_z$

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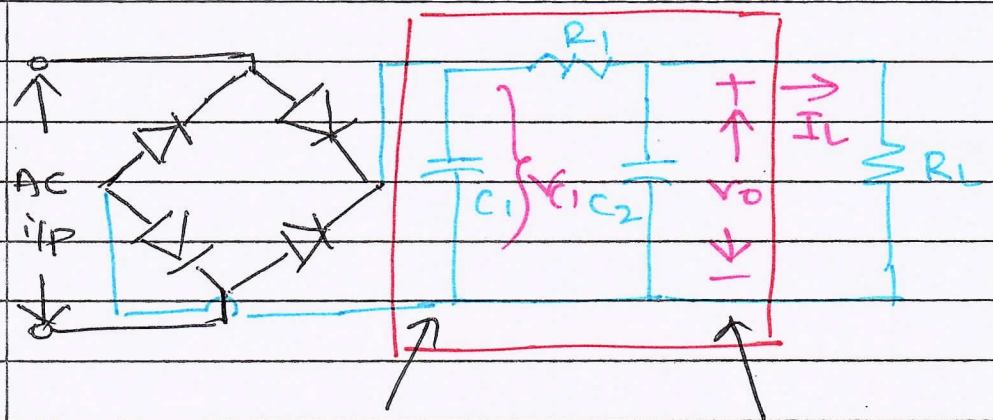
Q2C) RC-π Filter RC-π Filter (6M)



Ripple Voltage across C_1 ≡ AC voltage across C_2

Here additional capacitor C_1 and R_1 will attenuate the ripple contents from transformer O/p.

The shape of C_1, R_1, C_2 is like π symbol hence the name RC-π Filter

The harmonic components are more severely attenuated by voltage division across R_1 and C_2

∴ Peak voltage is $v_p = \frac{V_r}{\pi}$ 2M

$$\therefore v_{oC_2(ac)} = \frac{v_i X_{C_2}}{\sqrt{R_1^2 + X_{C_2}^2}}$$ 2M

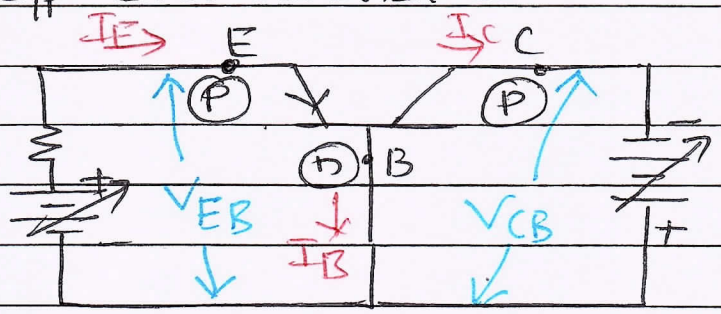
$$X_{C_2} = \frac{R_1}{\sqrt{(V_i/V_o)^2 - 1}}$$

$$\boxed{X_{C_2} \simeq R_1 / (V_i/V_o)}$$ 2M

Teacher's Sign.

Q3a) Common Base O/p characteristics -6M

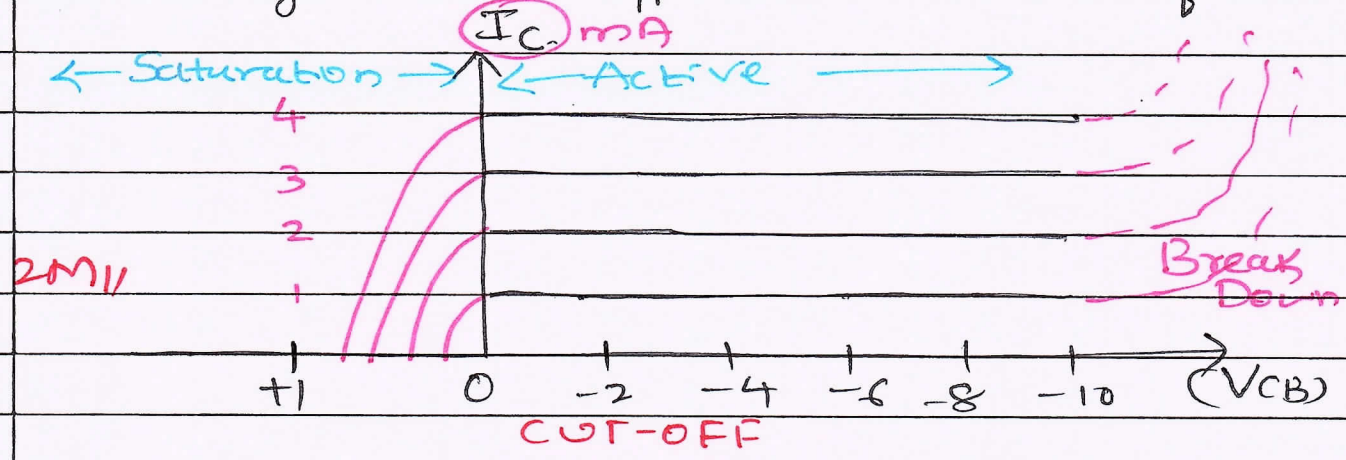
Consider the following ckt for common base O/p characteristics.



O/p characteristics are the plot of O/p voltage (V_{CB}) vs O/p Current (I_C) for various i/p current value (I_E), - 2M

For common base, Base will be common b/w i/p and o/p.

Following are the o/p characteristics of CB.



Saturation region: When V_{CB} is forward biased (left-side), where I_C remains constant.

Active region: When V_{CB} is reverse biased (right side), where I_C increases. 2MΩ

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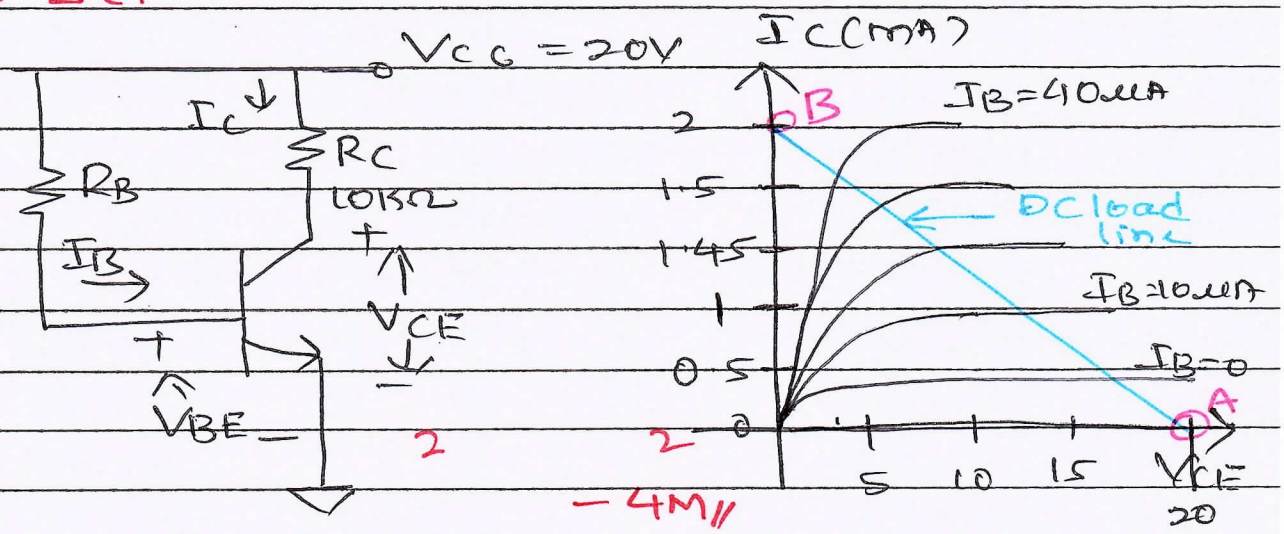
Q3b) DC load line on BJT in CE o/p chars.

It is the straight-line drawn on the o/p chars of BJT, which is the plot of V_{CE} vs I_C.



Step1: KVL to o/p path: $V_{CE} = V_{CC} - I_C R_C$ — (1)

Step2: Assume $I_C = 0$, $\therefore \boxed{V_{CE} = 20V}$ — (2) (A)

Assume $V_{CE} = 0$, $\therefore \boxed{I_C = 2mA}$ — (3) (B)

Step3: join point-(A) and (B), this is the DC load line for $R_C = 10K$, and $V_{CC} = 20V$. 4M//

Q3c) Given $I_C = I_E = ?$ / $\alpha = 0.98$, $I_B = 100\mu A$

$\beta_{DC} = ?$

we have $I_E = I_B + I_C$; $\alpha = \frac{I_C}{I_E}$ $\beta = \frac{I_C}{I_B}$

$\therefore \beta_{DC} = \frac{\alpha_{DC}}{1-\alpha_{DC}} = 49$// $I_C = \beta I_B$

$I_C = 4.9mA$//

$I_E = 5mA$//.

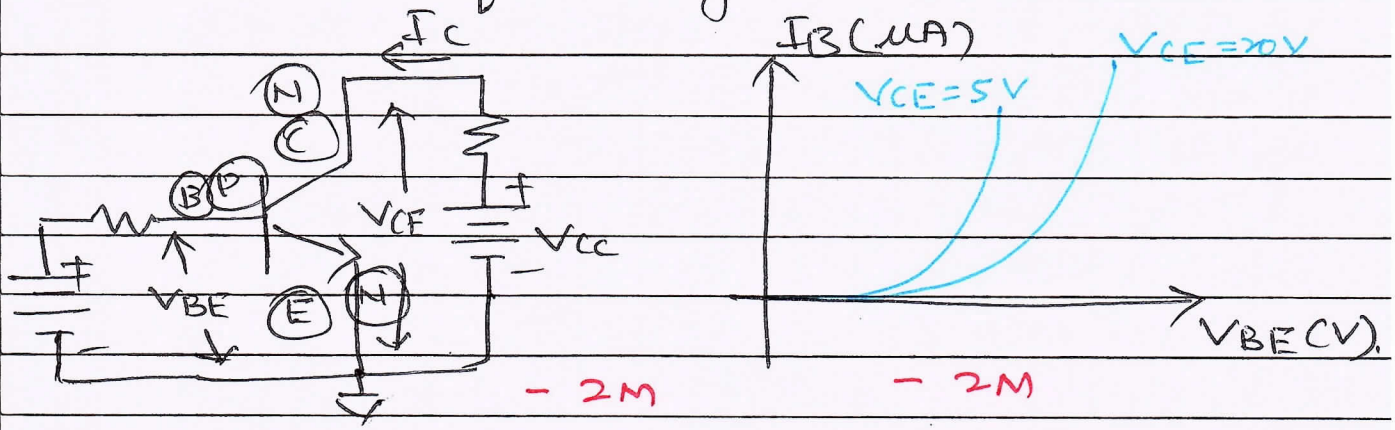
1 + 1 + 1 = 3M

Teacher's Sign.

Q4a) Common Emitter input characteristics.

It is the curve b/w input current I_B and input voltage V_{BE} for constant o/p voltage (V_{CE}).

consider the following ckt-



- 2M - 2M

From the characteristics we observe that-

* CE mode i/p characteristics resembles to that of a PN-junction diode, as V_{BE} crosses cut-in voltage, I_B increases for fixed level of V_{CE}
* But as observed above, for various V_{CE}, I_B may increase rapidly or slowly
* If V_{CE} is increased, due to early effect- I_B decreases and as V_{CE} is reduced, as early effect is not observed I_B increases the same is shown and can be observed

-2M

Teacher's Sign.

Q4b) Transistor as current amplifier:

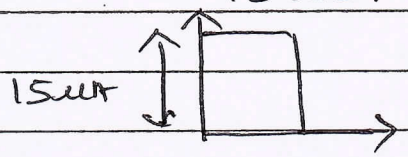
In BJT we have two current amplification factors α which can range from 0.95 to 0.995 and β which can range from 40 to 300. which are related as

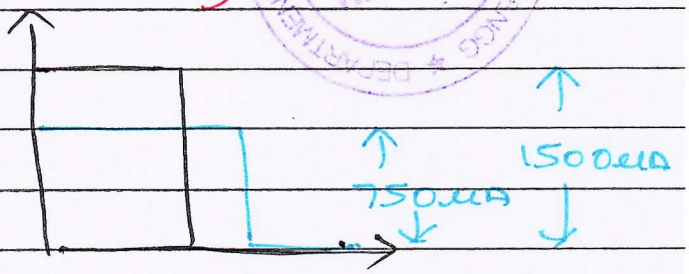
$$\alpha = \frac{I_C}{I_E} \quad \text{and} \quad \beta = \frac{I_C}{I_B} \qquad \} 2M$$

as α can vary approximately till 1, $I_C \simeq I_E$ hence it will not contribute any amplifica^n. Now consider $\beta = I_C/I_B$, consider following cases for various β value

β	I_B	I_C
50	15 μA	750 μA
100	15 μA	1500 μA

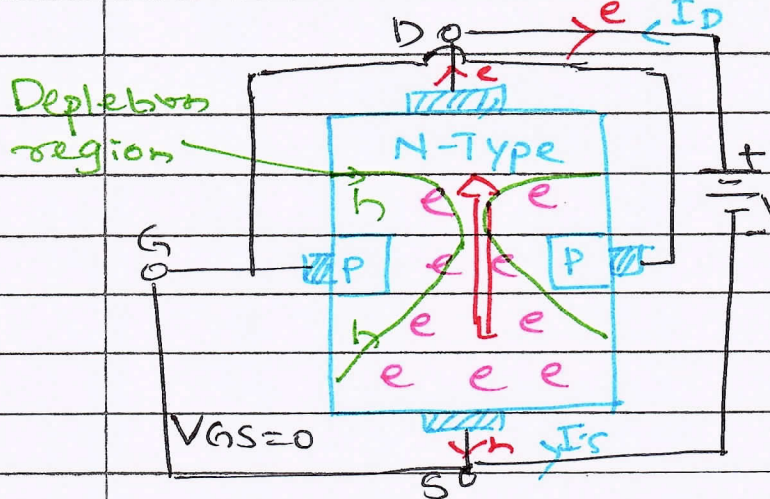
4M





Q4c) N-Channel JFET: Working can be understood by following cases

(i) When $V_{GS}=0$, V_{DS} = +ve — 4M



In this biasing maximum electrons reach drain hence constituting I_D, But- if V_{DS} is increased further, Drain to Gate region will be reverse biased, hence flow of electrons will be restricted

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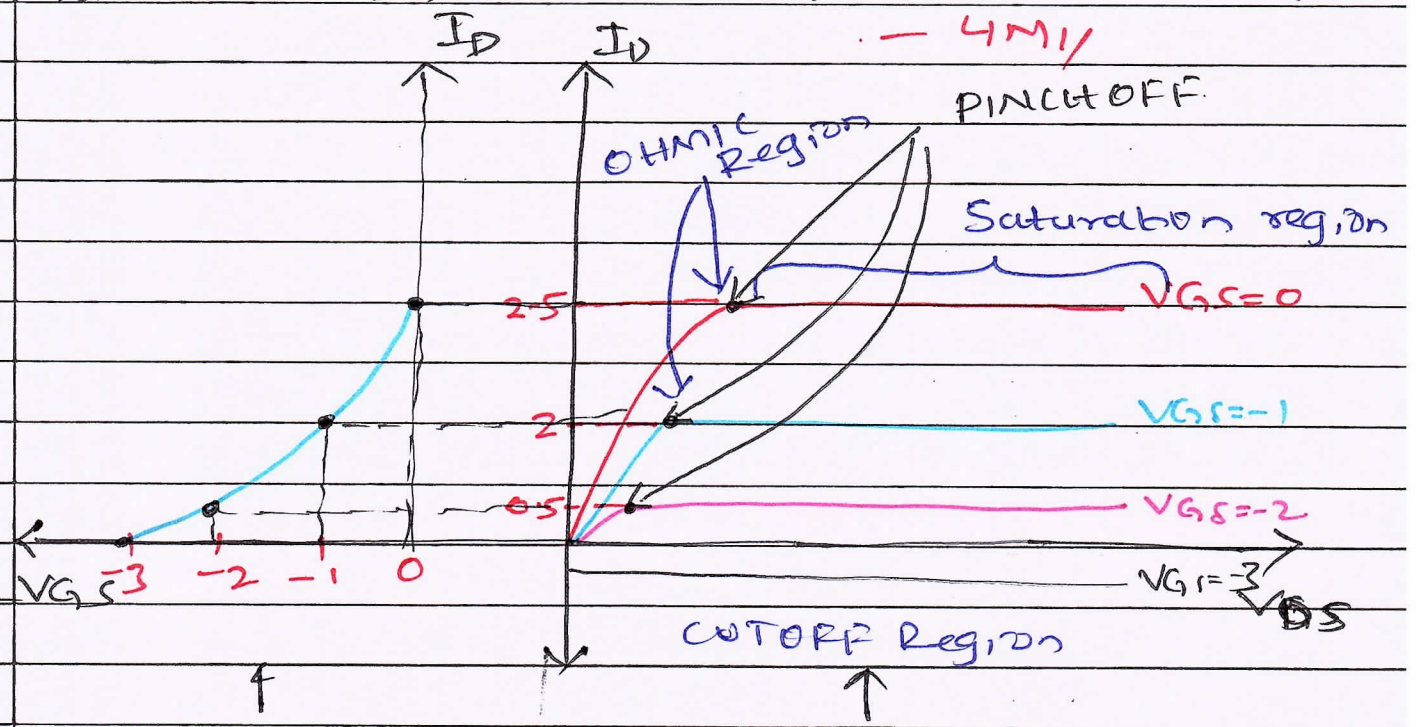
If the V_{DS} is increased further, then flow of electrons will be completely blocked, the voltage of V_{DS} at which this condition takes place is called "Pinch off" G D G S

Case(ii) : If V_{GS} is -ve and V_{DS} is +ve, as Gate is of P-Type, if it is made -ve with respect to then PINCHOFF condition reaches much earlier than when $V_{GS}=0$ and $V_{DS}=+ve$. This is shown in the below characteristics.



Transfer chars (I_D Vs V_{GS})

Drain characteristics (V_{DS} Vs I_D @ V_{GS})

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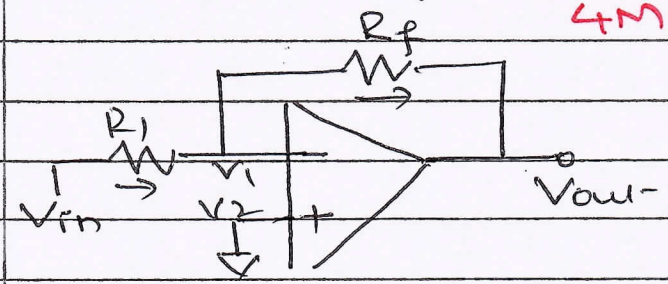
Q5a) Inverting and Non Inverting Amplifier

If the i/p is connected only to the inverting input, it is refered to as inverting configuration, and as non-inverting configuration if i/p is connected only to non-inverting i/p only

Inverting Amp^r ckt- 4M



KCL at- V1

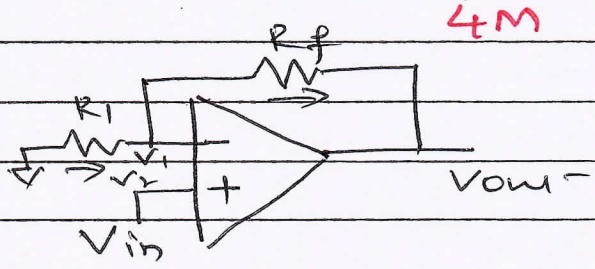
$$\frac{V_{in}-V_1}{R_1} = \frac{V_1-V_{out}}{R_f}$$

By Virtual ground $V_1=V_2=0$

$$\therefore V_{out(INV)} = \frac{-R_f}{R_1} V_{in}$$

$$Gain = -\frac{R_f}{R_1}$$

Non-Inverting Amp^r 4M



KCL at- V1

$$-V_1/R_1 = (V_1 - V_{out})/R_f$$

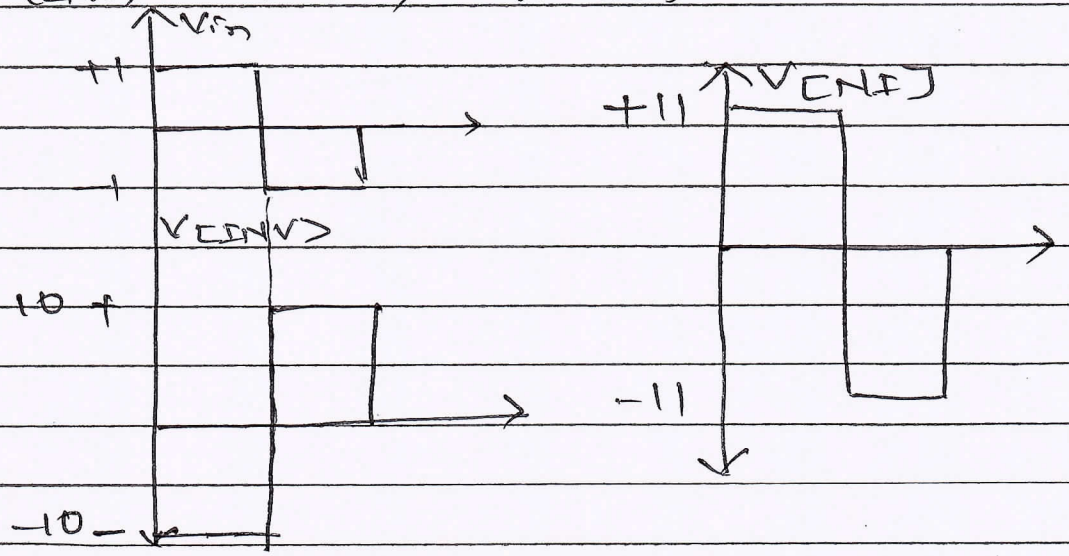
By Virtual ground $V_1=V_2=0$

$$V_{out(NI)} = \left[1+\frac{R_f}{R_1}\right] V_{in}$$

$$Gain = 1+\frac{R_f}{R_1}$$

Assume $V_{in} = 2V$, $R_f = 10K$, $R_1 = 1K$

$\therefore V_{out-(INV)} = -20V$, $V_{out-(NI)} = 22V$



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Q5b) Op-Amp is an Electronic device having two differential i/ps namely Inverting and Non-Inverting and one o/p pin which produces Differential amplified signals and also it can perform Arithmatic operation and as well as AC/DC amplification 2M

5- Ideal parameters op-Amp values

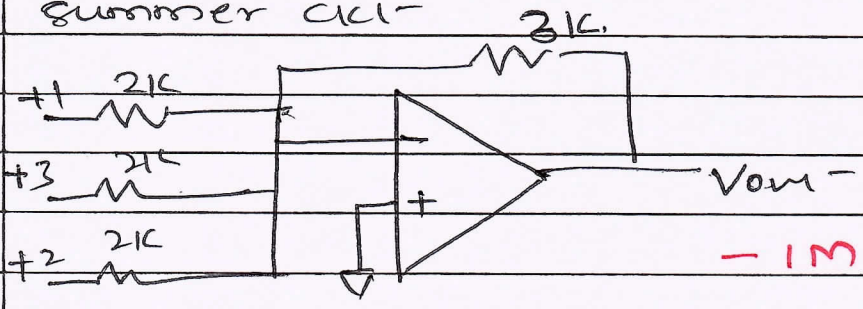
Parameter	Ideal value
Open loop voltage gain	$(A_V) = \infty$
O/p resistance	$(R_{out}) = 0$
I/p resistance	$(R_{in}) = \infty$
Bandwidth	$(B_W) = \infty$
Slew rate	$(SR) = \infty$

4M

Q5c) Given $V_1 = +1V$; $V_2 = +3V$; $V_3 = +2V$

$R_1 = R_2 = R_3 = 2K\Omega$; $R_f = 3K\Omega$

From Given data, it is a summer ckt-



-1M

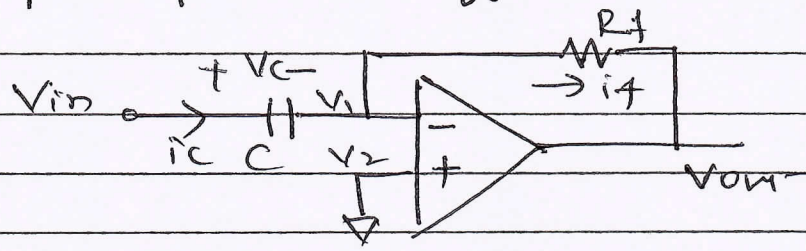
$$V_{out} = -\left[\frac{R_f}{R_1}V_1 + \frac{R_f}{R_2}V_2 + \frac{R_f}{R_3}V_3\right]$$

$$= -1.5\,[1+3+2] = -1.5\,[6] = -9V$$

5M

Teacher's Sign.

Q6a) Op-Amp as Differentiator



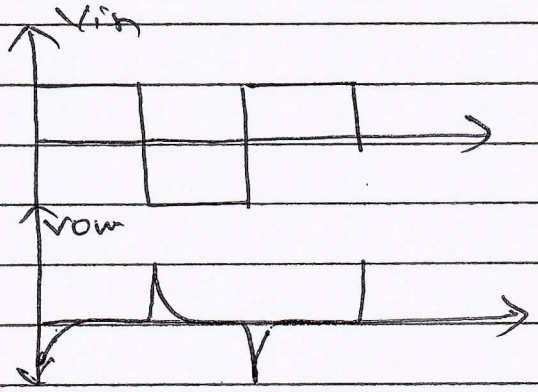
3M

KCL @ V1

$$\therefore C\frac{d(V_{in}-V_1)}{dt} = \frac{V_1 - V_{out}}{R_f}$$ Let $R_f = R$

3M

$$\therefore V_{out} = -RC\frac{dV_{in}}{dt}$$ By virtual ground $V_1 = 0$



2M

Q6b) Input offset current: The difference in magnitude of I_{b1} and I_{b2} is called I_{io}

$$I_{io} = |I_{b1} - I_{b2}|$$ 1M

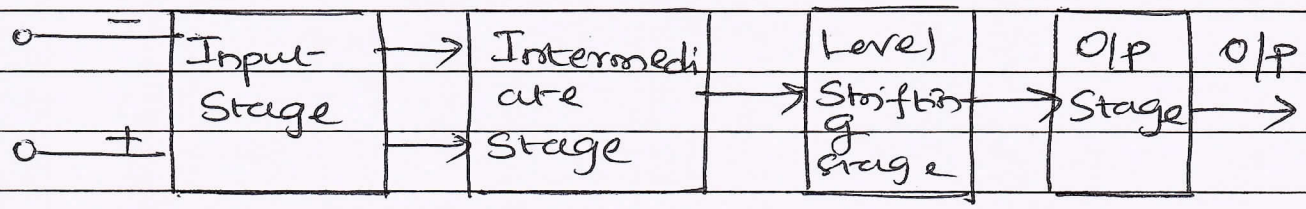
Input Bias current: I_b is the current flowing through the two terminals when device is biased $I_b = \frac{|I_{b1}| + |I_{b2}|}{2}$ 2M

Slew Rate: It is the maximum rate of change of o/p voltage w.r.t time $SR = \frac{dV_{out}}{dt}\Big|_{Max}$ 1M

CMRR: It is ratio of differential gain to common mode gain CMRR = $\left|\frac{A_d}{A_c}\right|$ 2M

Teacher's Sign. OK

Q6c Op-Amp Blockdiagram and ckt-



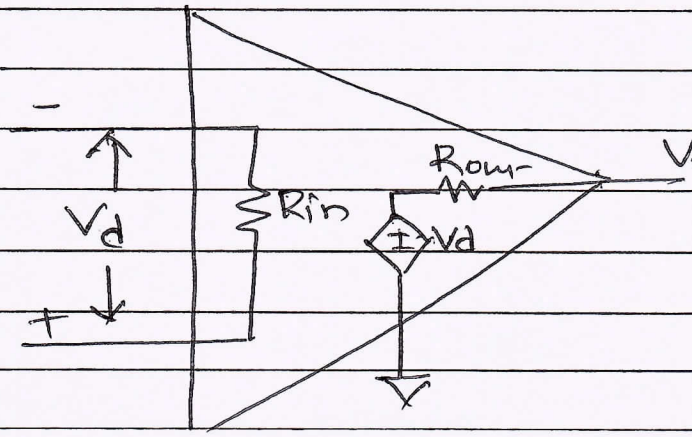
Input Stage: The basic requirement of the i/p stage of Op-Amp are AV, Ri, Rout, CMRR etc

3M

Intermediate Stage: It is the stage two i/p are differentiated and amplified as per the application need.

Level Shifting Stage: During the amplification if o/p levels are going beyond by +Vcc or -VEE by + OFFSET pin

Output Stage: It is the o/p pin through which o/p is taken



3M

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Q7a) (i) $(2AB.8)_{16} = (\quad)_{10}$

$= 2\times16^2 + A\times16^1 + B\times16^0 + 8\times16^{-1}$

$= [illegible] + (512+160+12+0.5) = (684.5)_{10}$ //

(ii) $(416.12)_{10} = (\quad)_8 = (640.07405)_8$ //

8 | 416		$0.12\times8 = 0.96 = 0$
8 | 52 - 0 ↑		$0.96\times8 = 7.68 = 7$
6 - 4		$0.68\times8 = 4.08 = 4$
		$0.08\times8 = 0.64 = 0$
		$0.64\times8 = 5.12 = 5$ ↓

3M //

(iii) $(25.375)_{10} = (\quad)_2 = (11001.011)_2$ //

2 | 25		$0.375\times2 = 0.75 = 0$
2 | 12 - 1 ↑		$0.75\times2 = 1.50 = 1$
2 | 6 - 0		$0.50\times2 = 1.00 = 1$
2 | 3 - 0		0.00×22 $0.00 = 0$ ↓
1 - 1		

3M //

(iv) $(16.2)_8 = (\quad)_{16}$

1 6 . 2

Group of 4

001 110 . 010 → 0000 1110 . 0100 $= (0E.4)_{16}$ //

Q7b) $F_1 = \bar{x}y\bar{z} + \bar{x}\bar{y}z$, By DMT we get-

$\bar{F}_1 = \overline{\bar{x}y\bar{z} + \bar{x}\bar{y}z} = (\bar{x}y\bar{z}).(\bar{x}\bar{y}z)$

$= (\bar{\bar{x}} + \bar{y} + \bar{\bar{z}}).(\bar{\bar{x}} + \bar{\bar{y}} + \bar{z}) = (x+\bar{y}+z)(x+y+\bar{z})$

$= xx + xy + x\bar{z} + x\bar{y} + \bar{y}y + \bar{y}^2 + xz + xy + z\bar{z}$

$= 1 + xy + x(z+\bar{z}) + \bar{y}(x+z)$

$= 1 + xy + x + x\bar{y} + \bar{y}z$

$= (1+x) + x\bar{y} + \bar{y}z$

$= 1 + x[1+\bar{y}] + \bar{y}z$

$= 1 + x + \bar{y}z$

$= 1 + \bar{y}z$ //

4M //

Teacher's Sign.

Q7b) $F_2 = x[\bar{y}\bar{z} + yz] = x\bar{y}\bar{z} + xyz$

$\bar{F}_2 \overset{DMT}{=} \overline{(x\bar{y}\bar{z}) + (xyz)} = \overline{(x\bar{y}\bar{z})} \cdot \overline{(xyz)}$

$= (\bar{x} + y + z) \cdot (\bar{x} + \bar{y} + \bar{z})$

$= \bar{x}\cdot\bar{x} + \bar{x}\bar{y} + \bar{x}\bar{z} + \bar{x}y + y\bar{y} + yz + \bar{x}z + \bar{y}z + z\bar{z}$

$= \bar{x} + \bar{x}\bar{y} + \bar{x}\bar{z} + \bar{x}y + yz + \bar{x}z + \bar{y}z$

$= \bar{x}[1 + \bar{y}] + \bar{x}(\bar{z} + z) + \bar{x}y + yz + \bar{y}z$

$= \bar{x} + \bar{x} + \bar{x}y + yz + \bar{y}z$

$= \bar{x} + \bar{x}y + yz + \bar{y}z = \bar{x}(1 + y) + yz + \bar{y}z$

$= \bar{x} + yz + \bar{y}z$ 4M

Q7c) Working of Half adder

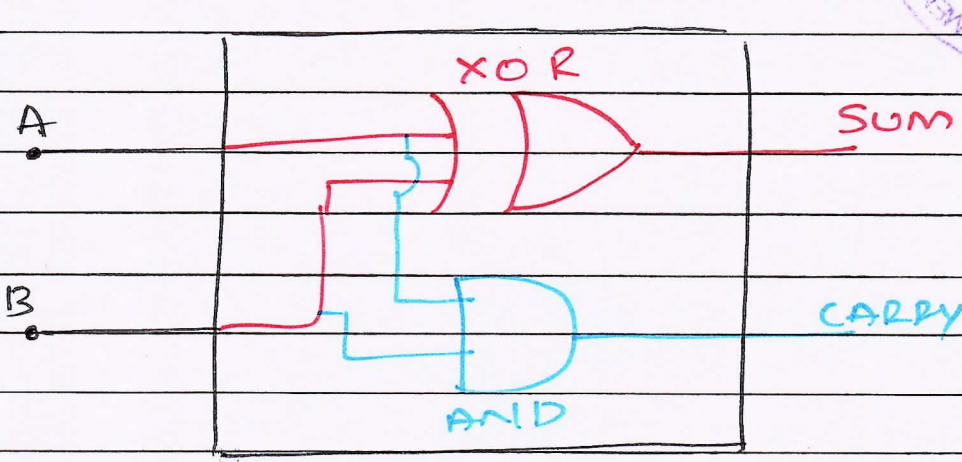
It is a 1 bit adder which adds two one bit numbers say (A & B) and produces results (1 bit of sum (S) and carry (C), consider the following Truth table

A	B	S	C
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

$S = \bar{A}B + A\bar{B} = A \oplus B$

$C = A \cdot B$. 3M

Logic Diagram



HALF ADDER 3M

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Q8a) $F = A + \bar{B}C$ in Sum of minterms

$F = A(B+\bar{B}) + \bar{B}C(A+\bar{A})$

$= AB + A\bar{B} + A\bar{B}C + \bar{A}\bar{B}C$

$= AB(C+\bar{C}) + A\bar{B}(C+\bar{C}) + A\bar{B}C + \bar{A}\bar{B}C$

$= ABC + AB\bar{C} + A\bar{B}C + A\bar{B}\bar{C} + A\bar{B}C + \bar{A}\bar{B}C$

$= ABC + AB\bar{C} + A\bar{B}C + A\bar{B}\bar{C} + \bar{A}\bar{B}C$

$= \bar{A}\bar{B}C + A\bar{B}C + AB\bar{C} + ABC$

$= m_1 + m_4 + m_5 + m_6 + m_7$

$F(A,B,C) = \Sigma(1,4,5,6,7)$

4M + 4M

Q8b) Mention Postulates and theorems of Boolean Algebra

Theorems and Postulates 4M		• 4M
(1) Demorgans Thm	$(\overline{x+y}) = \bar{x} \cdot \bar{y}$	$(\overline{xy}) = \bar{x} + \bar{y}$
(2) commutative "	$x+y = y+x$	$x \cdot y = y \cdot x$
(3) Idempotent	$x+x = x$	$x \cdot x = x$
(4) complementry	$x+\bar{x} = 1$	$x \cdot \bar{x} = 0$
(5) Absorption	$x+xy = x$	$x(x+y) = x$
(6) Identity	$x+0 = x$	$x \cdot 1 = x$
(7) Distributive	$x(y+z) = xy+xz$	$x(yz) = (xy)z$

Q8c) A Full adder is a 1-bit adder which can add 3-1 bit numbers i/p say A, B & C and produces 2-1 bit results Sum (S), and Cout (Carry) 3M

A	B	Cin	Sum	Carry
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

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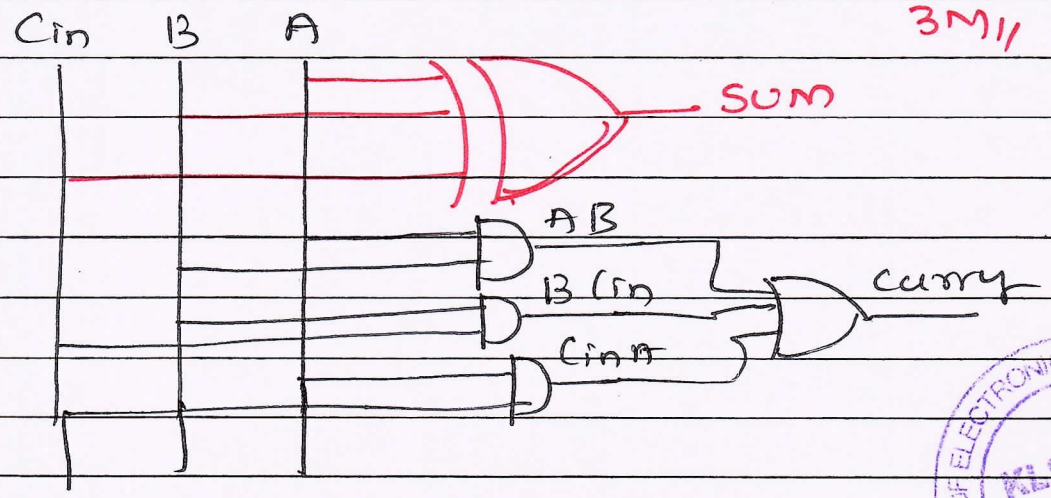
Q8c

Sum = $A \oplus B \oplus C_{in}$

Carry = $AB + BC_{in} + C_{in}A$



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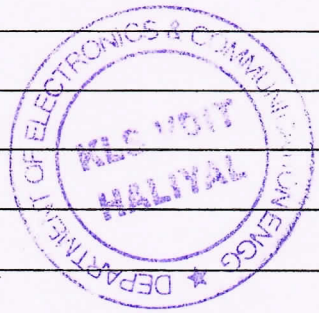
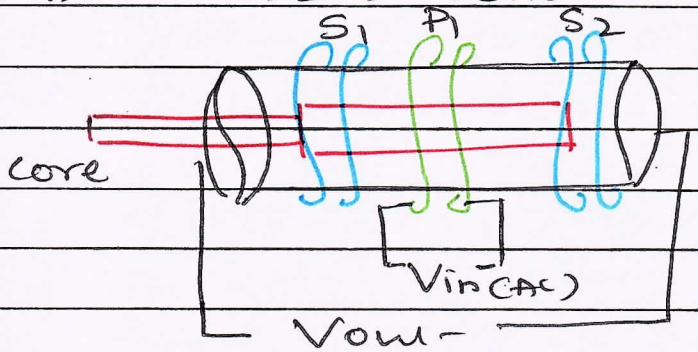


Module-5

Q9a) Working of LVDT

LVDT stands for Linear Variable Differential Transducer. Its construction is shown below.



It consists of 2 Secondary windings S1 & S2 and Primary winding P1. movable core

If core is moved towards S_1, then $V_{out} = V_{S1} - V_{S2}$, if core is towards S_2, $V_{out} = V_{S2} - V_{S1}$, which indicates the change in voltage w.r.t change in distance, Here displacement is converted to voltage

3M//

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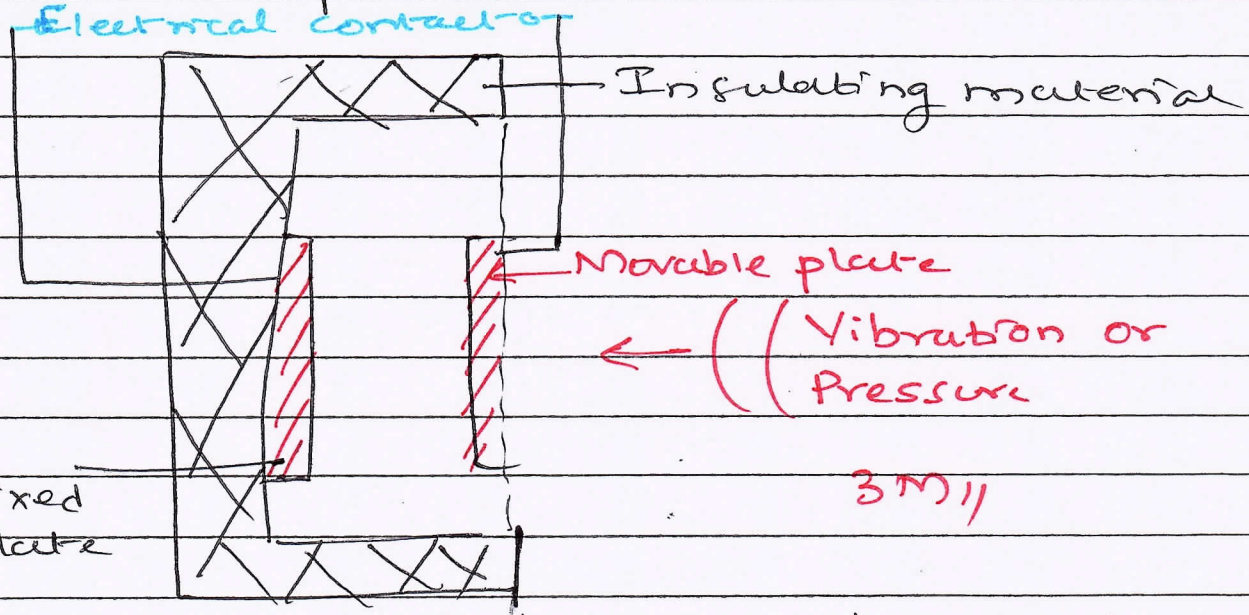
Q 9b) Capacitive Pressure Transducer

Working Principle: Pressure is converted to suitable capacitance value



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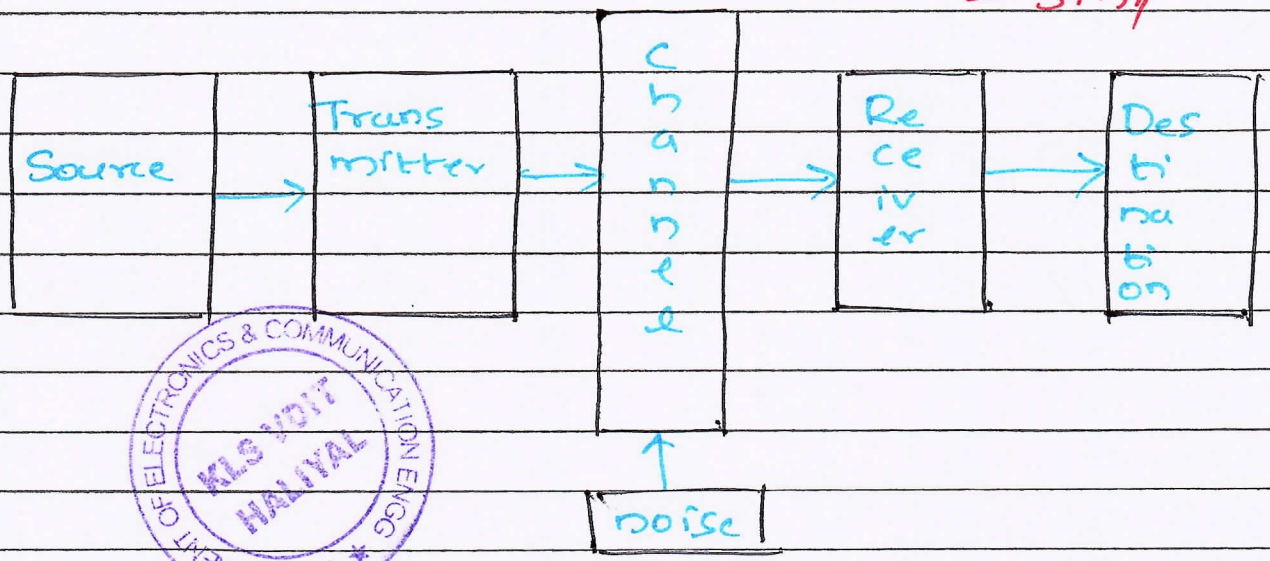
It is like an Audio setup of microphone where vibrations of sound are converted to capacitance value, such that charge $Q = CV$ changes w.r.t vibration and hence voltage also.

3M

Q 9c) Working of communication system

3M



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Q9(c) Information Source: It is the place from which communication data will be established, it can be in either audio, video or any other physical form. Let us assume an audio set-up. In this place we can have an audio signal

2M)

Transmitter: The basic function of transmitter is to convert information in to suitable electrical signal, in this audio (voice) will be converted in to electrical signal using a microphone

1M)

Channel: It is the medium through which the information will be traveling/reaching the destination It can be a wired/wireless channel

1M)

Noise: It is an unwanted signal which exists in nature which may get added up with the channel

1M)

Receiver: The function of the receiver is to convert the electrical signal received from channel in to suitable form, here electrical signal is converted back to audio by speakers

Teacher's Sign.

Q10 a) Thermistors

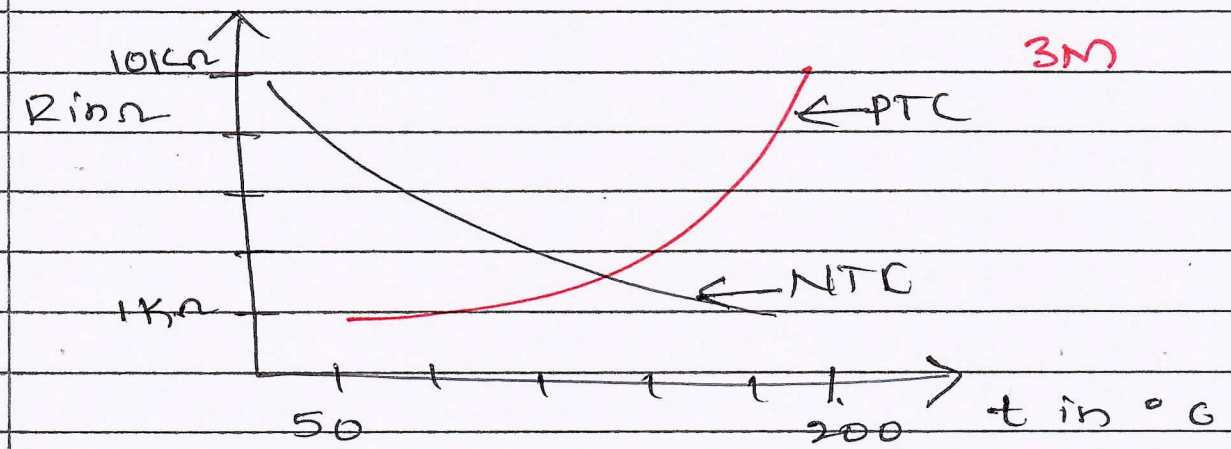
→ Thermally sensitive resistor

→ These perform the transduction of temperature to resistance conversion

→ These posses two type of change in resistance

NTC: Negative temperature Resistance, where resistance is inversly proportional to temperature 3M

PTC: Positive temperature Resitance, where resistance and temperature are directly proportional to each other.



3M

Q10 b) Short Note on Photo Diode

→ It is a transducer device which converts light energy in to suitable electrical energy

→ Symbol and construction, use

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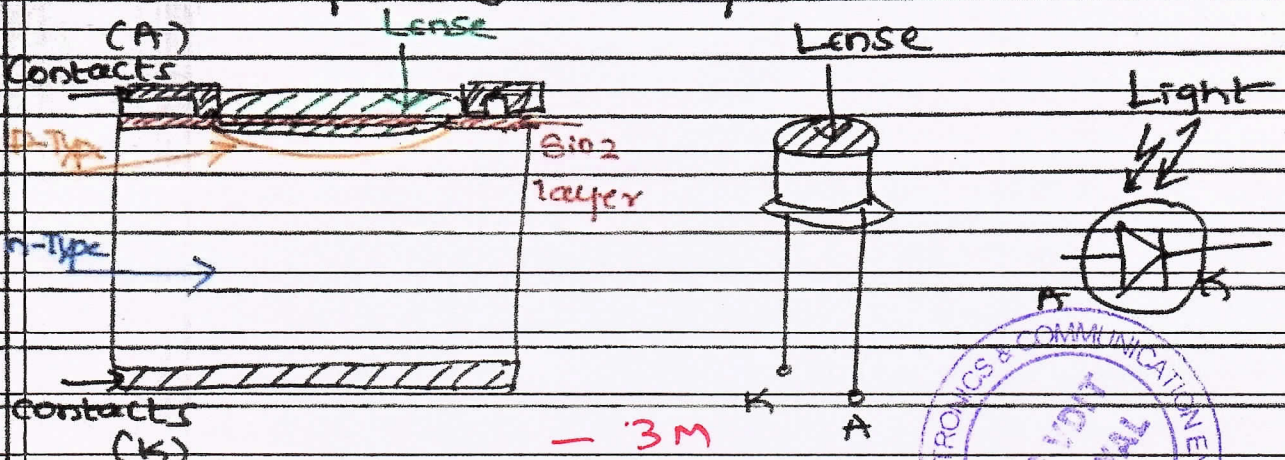
Q.10b) 2. Photo Diode :

Photo diode is a semiconductor device which requires light energy along with the biasing voltage. Generally it is operated in reverse bias condition, in which if it is exposed to the sufficient intensity of light, it allows the flow of electrons along with the minority charge carriers.

Following Fig ... shows the construction details, package and symbol.



construction details — Package — Symbol

Fig ...

From Fig 5.25 construction details, we can note that a typical photo diode consists of P-N junction layer, at the junction a photo sensitive lense is provided, through which light enters in to the junction. The contacts near P-layer forms the anode (A) and contact near N-layer form the cathode (K). Also we can see the package view. From symbol we can note that incoming arrows indicate the direction of light.

- 3M

Teacher's Sign

Q 10c) Def^n of Modulation and Need for Modulation:

Modulation: Process of changing any one parameter like Amplitude, frequency or phase of carrier wave w.r.t the message signal. — 2M

Need For Modulation:

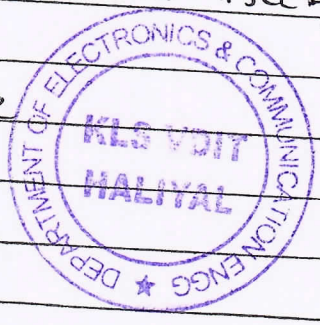
1) To Reduce Height of Antenna: wave length $\lambda = \frac{c}{f}$, if $f = 3KHz$ and if $f = 1MHz$, we can see that height of antenna required will be 25KM ($\lambda/4$) and 75 m. ($\lambda/4$) respectively, Hence by frequency modulation we can control the height of antenna

2) To increase the distance of communication: By frequency and phase modulation can be employed

3) To avoid overlapping of signals: In modulation by using Guard bands we can avoid interference

4) To reduce the effect of noise

6M



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