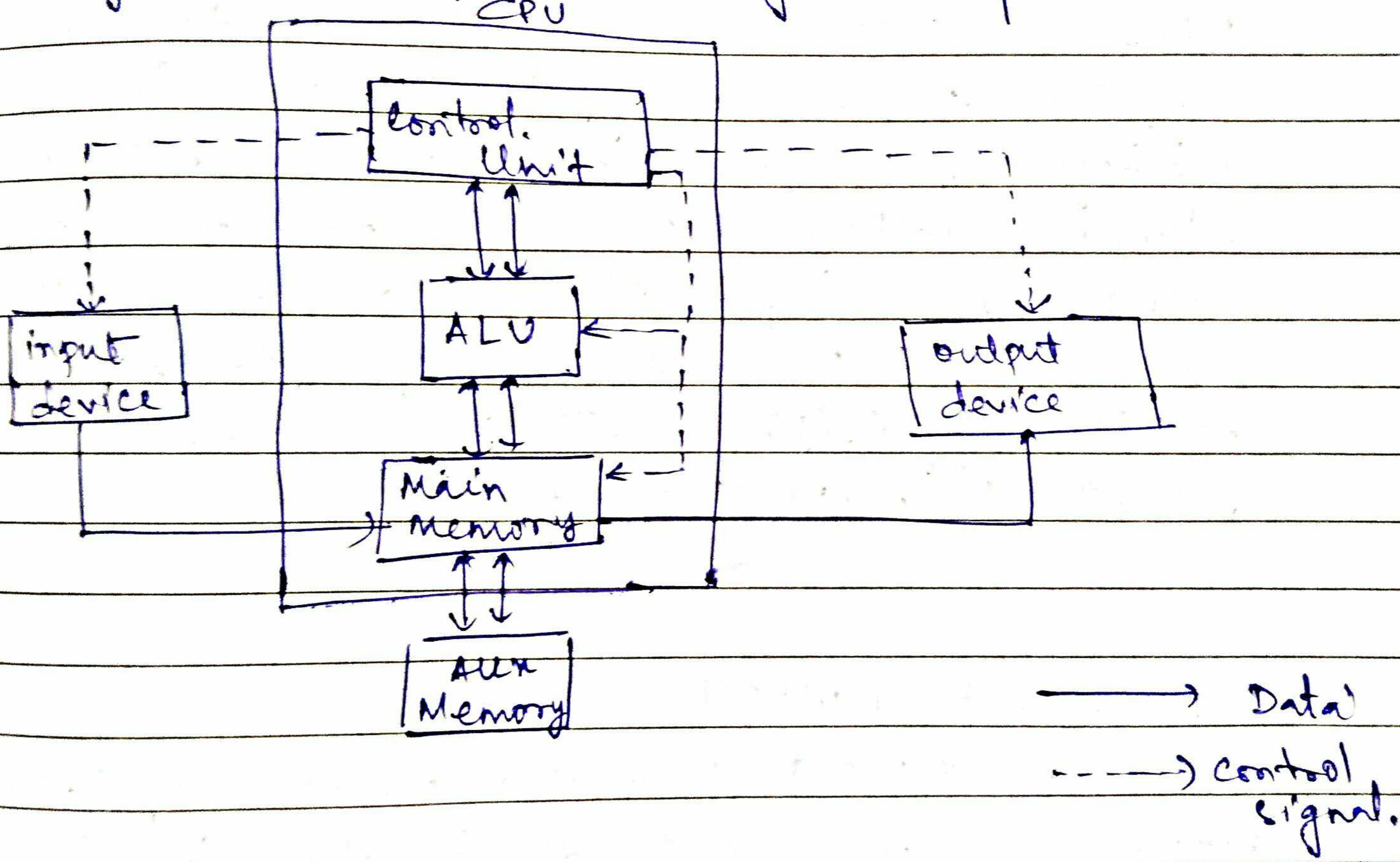
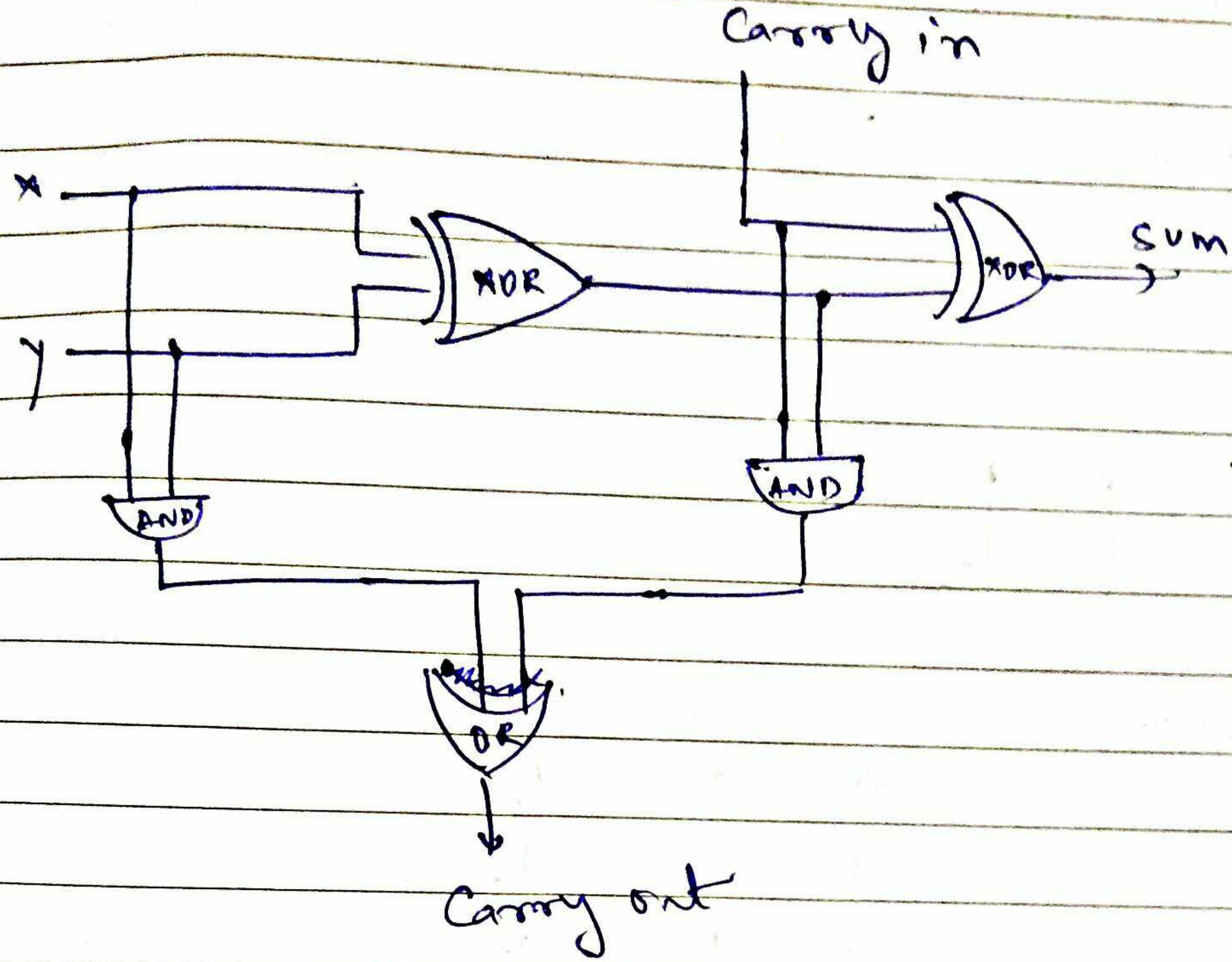
1) Organisation of Basic Digital Computer

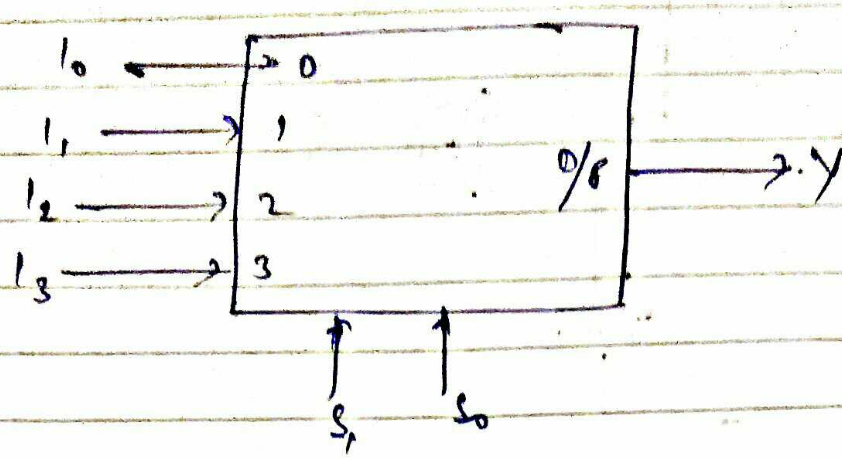


2) Full Adder



INPUT			OUTPUT	
x	y	Carry in	Sum	Carry out
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

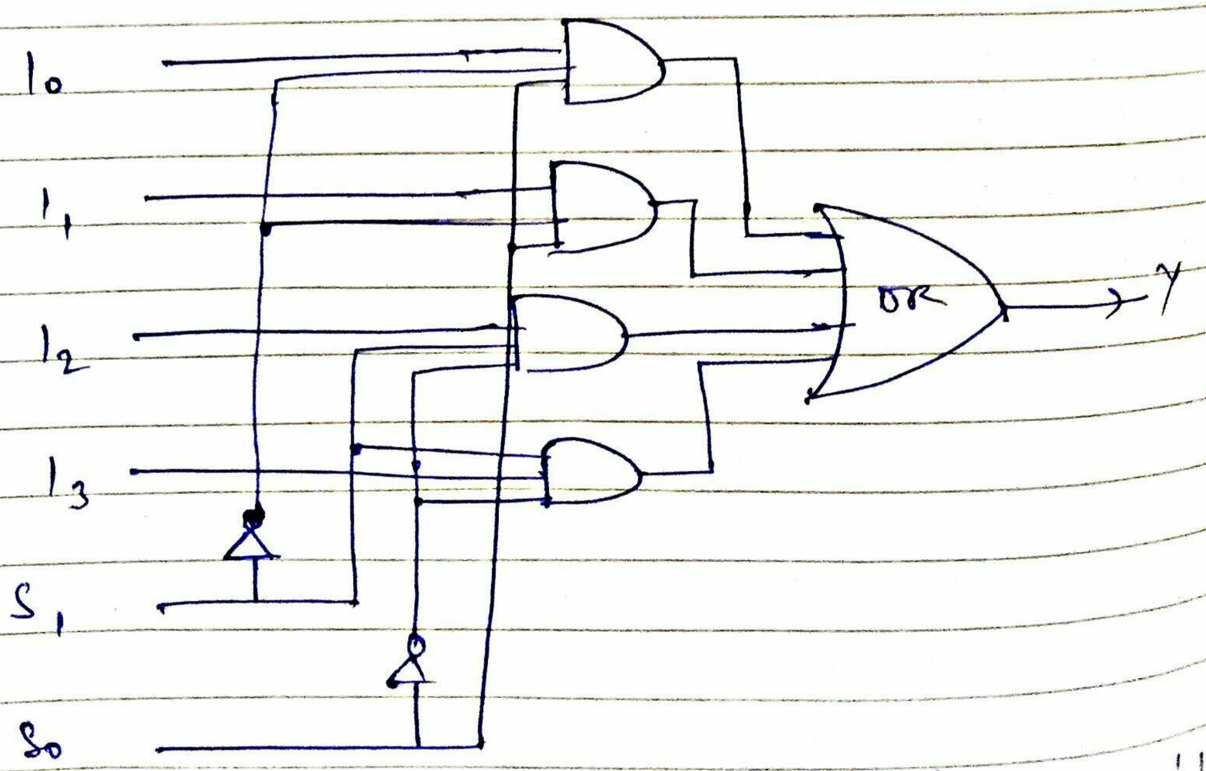
3) 4 : 1 MUX



Truth Table

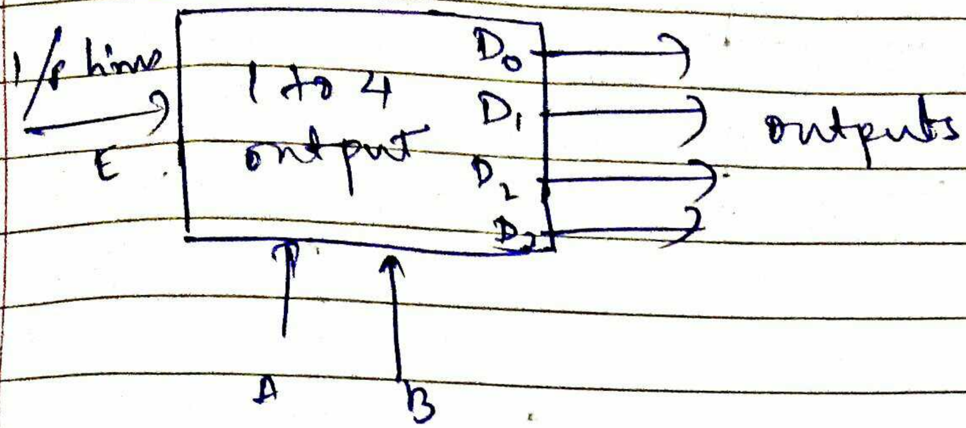
S_1	S_0	Y
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3

Logic Diagram

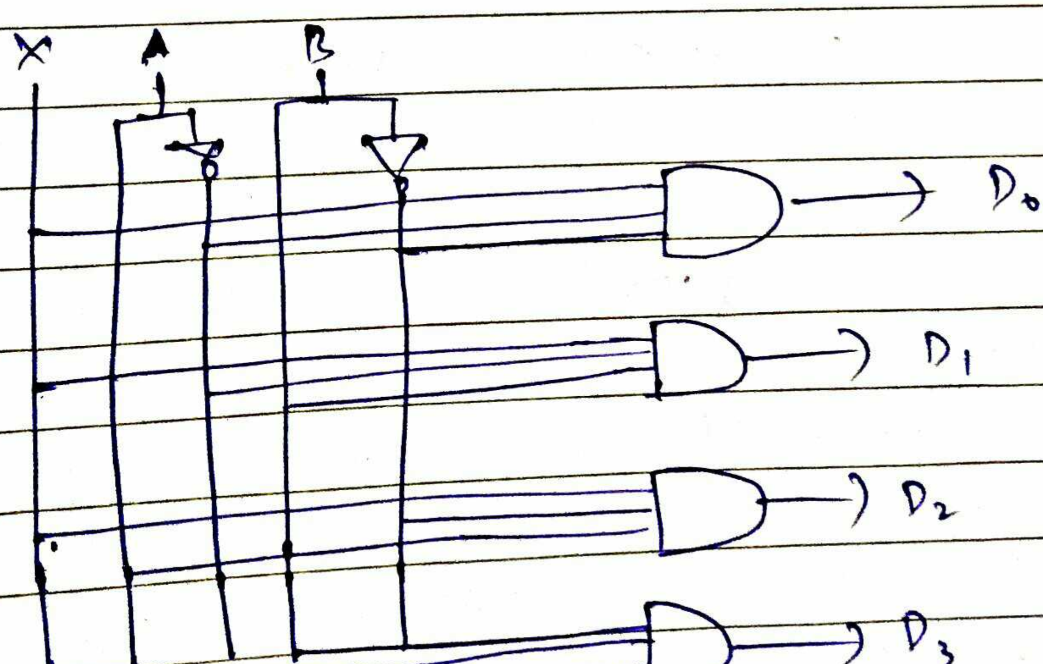


$$Y = S_1' S_0' I_0 + S_1' S_0 . I_1 + S_1 S_0' I_2 + S_1 S_0 I_3$$

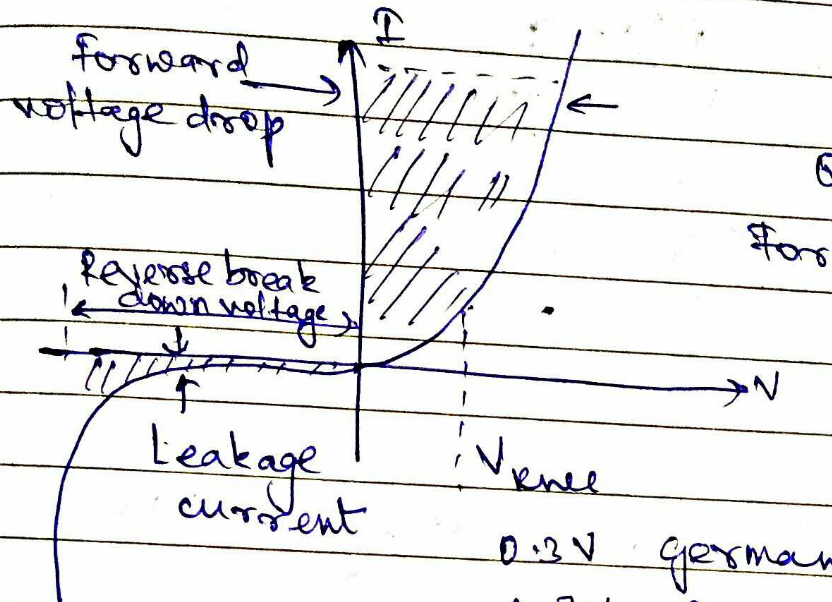
1 in 4 demux



E	Select		O/P			
I/p	A	B	D_0	D_1	D_2	D_3
1	0	0	1	0	0	0
1	0	1	0	1	0	0
1	1	0	0	0	1	0
1	1	1	0	0	0	1



4) IV Characteristics :

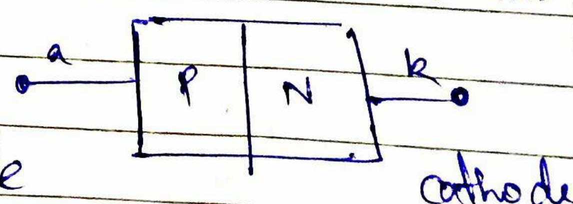


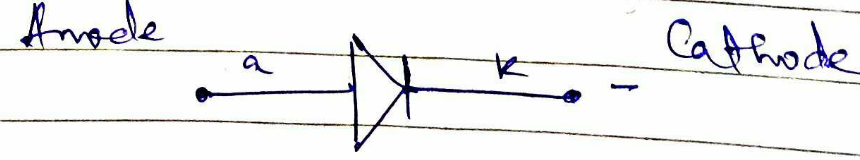
Quadrant I
Forward Operating Region

0.3V germanium
0.7V silicon

Quadrant III
Reverse operating region

Conventional Current Flow

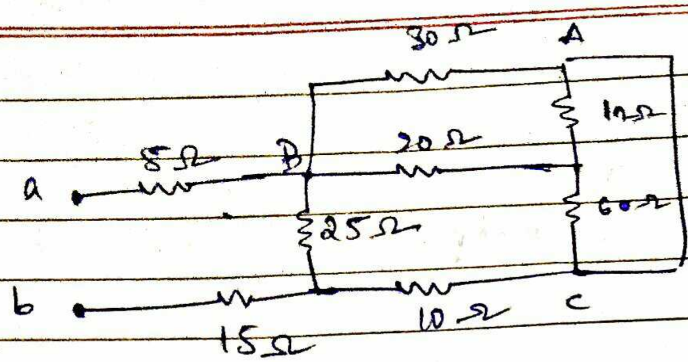


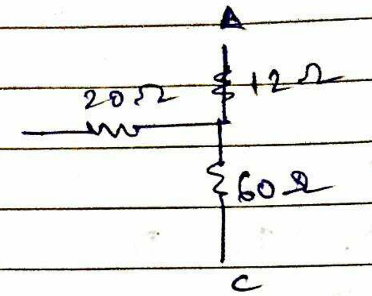


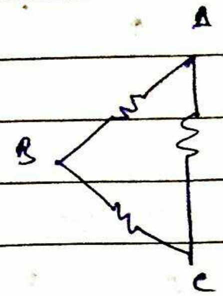
5) Forward Biased PN Junction Diode

When a diode is connected in a Forward Bias condinition, a negative voltage is applied to the N-type material a positive voltage to the P-type material. If this external voltage becomes greater than the value of the potential barrier, approx 0.7 volts for Si and 0.3 volts for Ge, the potential barrier opposition will be overcome and current will start to flow.

7)





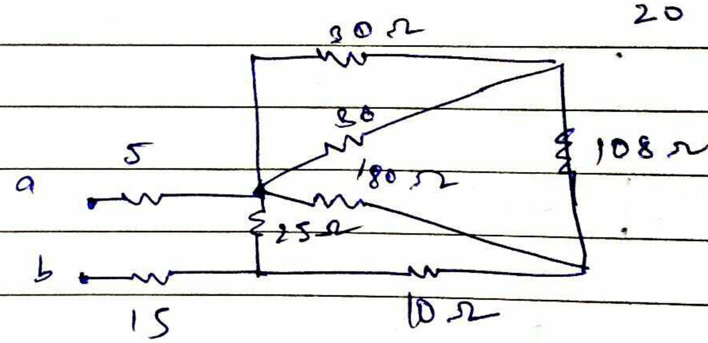


⅄ → Δ

$$R_{AB} = 12 + 20 + \frac{12 \times 20}{60} = 36\,\Omega$$

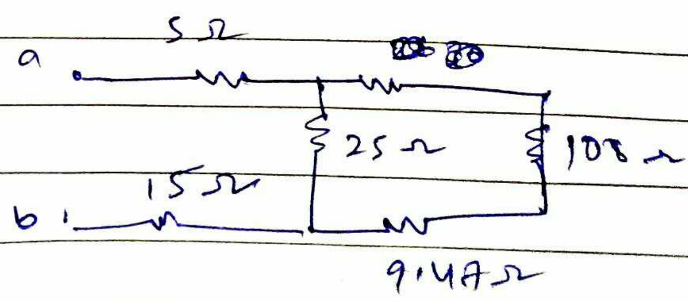
$$R_{BC} = 80 + 60 + \frac{1200}{12} = 180\,\Omega$$

$$R_{AC} = 12 + 60 + \frac{12 \times 30}{20} = 108\,\Omega$$



$$30 \parallel 36 = \frac{30 \times 36}{66} = 20\,\Omega$$

$$180 \parallel 10 \quad \frac{1800}{190} = 9.47\,\Omega$$

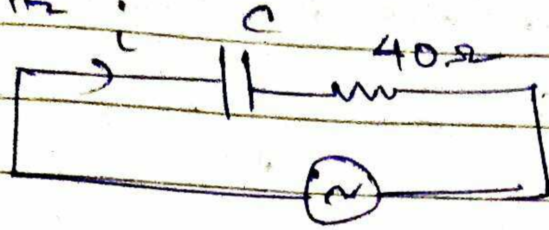


$$R_{eq} = \left\{ \left(26 + \overset{9.47}{\cancel{9 + 47}} \right) \| 25 \right\} + 5 + 15$$

$$= \left(\frac{35.5 \times 25}{60.5} \right) = 14.67\,\Omega + 5 + 15$$

$$= \underline{\underline{36.67\,\Omega}} \quad \Leftarrow \text{Ans}$$

9) $f = 60\,Hz$



$i = 3A$

$Z = 50\Omega$

a) $Z = \sqrt{R^2 + X_c^2}$

$\Rightarrow 50^2 - 40^2 = \left(\frac{1}{2\pi f C}\right)^2$

$\Rightarrow 900 \times 2^2 \times \pi^2 \times 60^2 = \frac{1}{C^2}$

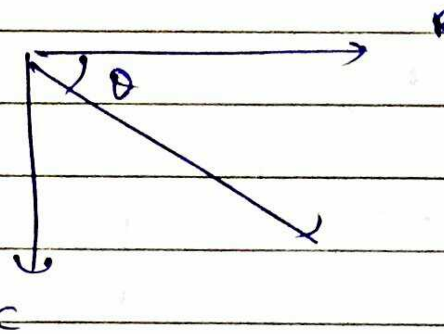
$\Rightarrow C = 8.84 \times 10^{-6}\,F$

$\Rightarrow C = 8.84\,\mu F$

b) $V = IZ$

$\Rightarrow V = 3 \times 50$

$= 150\,V$



$\tan\theta = \frac{X_c}{R}$

$= \frac{1}{(2\pi f)CR} = \frac{30}{40}$

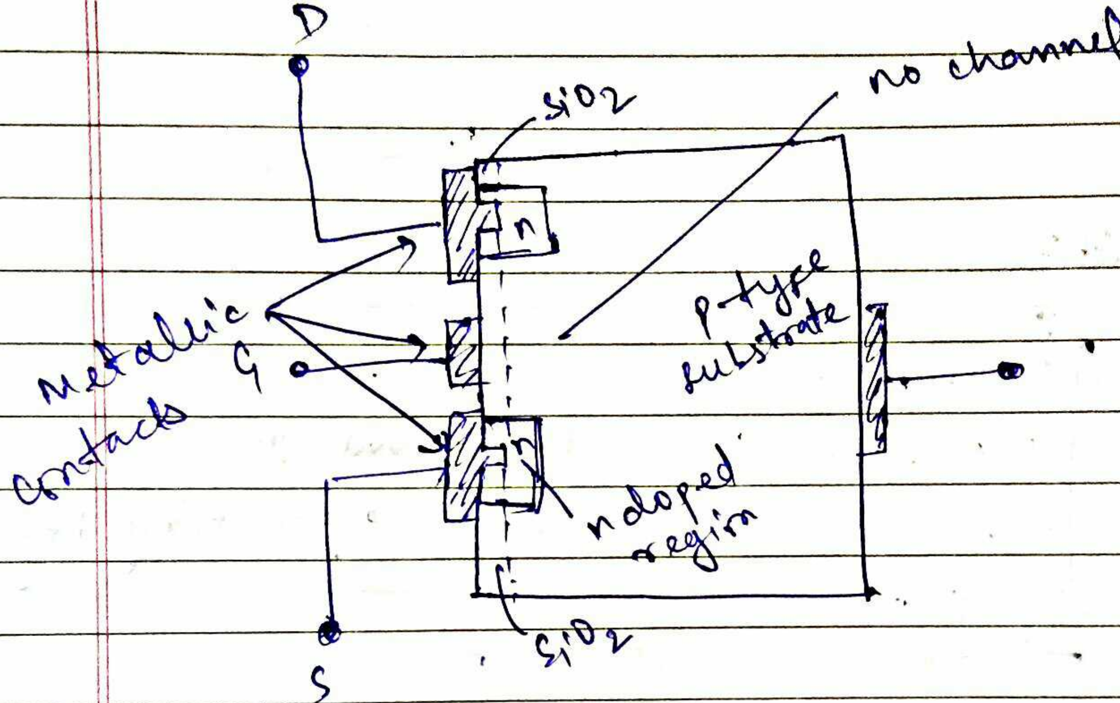
$\theta = \tan^{-1} 3/4 = 36.8°$

D) $V_R = IR = 3 \times 40 = 120V$

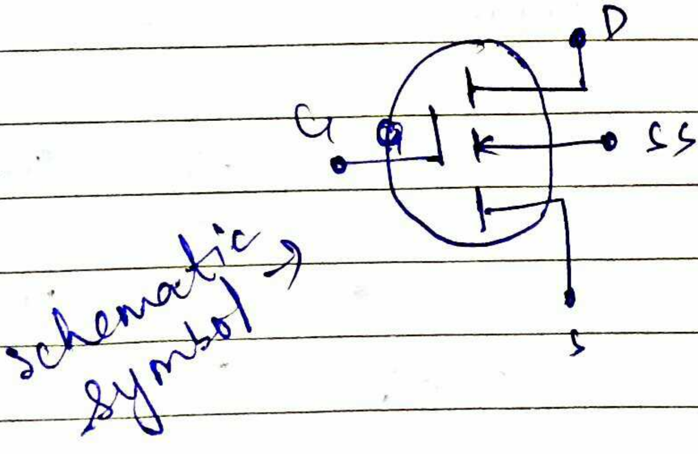
$V_c = I \cdot X_c = 3 \times \frac{1}{2\pi f C} = 90V$

10) Enhancement MOSFET

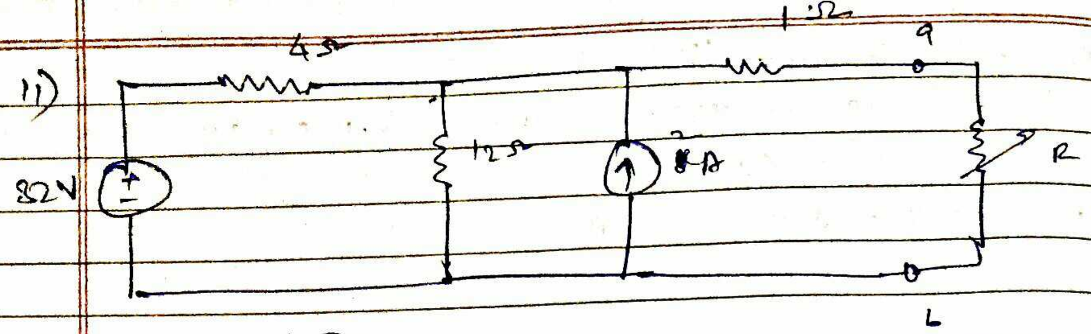
The enhancement has the absence of channel between source and drain terminals.

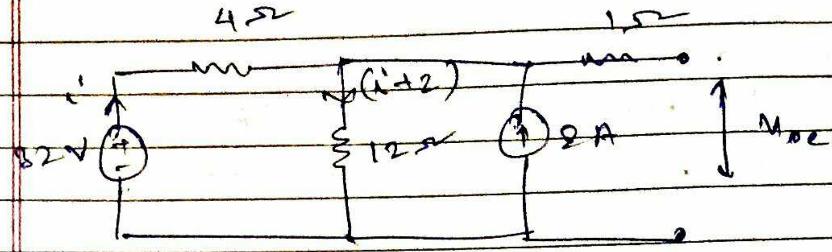


N-channel enhancement-type MOSFET



11)





$+32 - 4i - 12(i'+2) = 0$

$\Rightarrow \quad 32 = 16i' + 24$

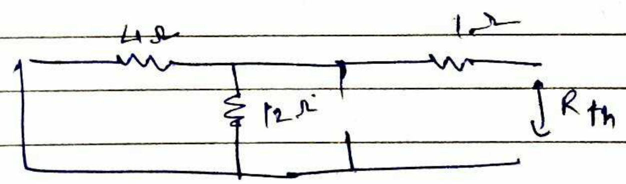
$\Rightarrow \quad i' = \frac{8}{16}$

$\Rightarrow \quad i' = 0.5\ A$

$V_{oc} = (i'+2)\,12$

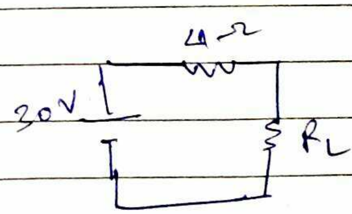
$= \frac{5}{2} \times 12 = 30\ V$

for R_{Th}



$12 \| 4 + 1$

$R_{th} = \frac{12 \times 4}{16} + 1 = 4\ \Omega$



$i = \frac{30}{4 + R_L}$

$R_L = 6 \qquad i = \frac{30}{4+6} = 3A$

$R_L = 16 \qquad i = \frac{30}{4+16} = 1.5\ A$

$R_L = 36 \qquad i = \frac{30}{4+36} = \frac{3}{4} = 0.75A$