Benha University
Faculty of Engineering at Shoubra
Energy Engineering Dep.

Final Term Exam
Date: Saturday (18/05/2019)
Subject: Electronic Engineering
Duration: 2 hours

- Answer all the following questions
- The exam is in one Page
- No. of questions : 3
- Total Mark: 40 Marks

Question (1) (10 Marks)

(a) What are the ratings of V_{IN} in figure (1) if I_{Zmin}=0.25mA, P_z(max)=1W, V_z=10V. **[5 marks]**

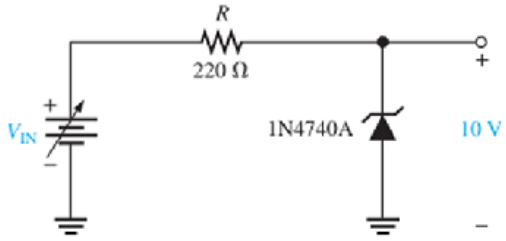


Figure (1)
(5 marks)

(b) Draw the output from the following circuit in figure (2)

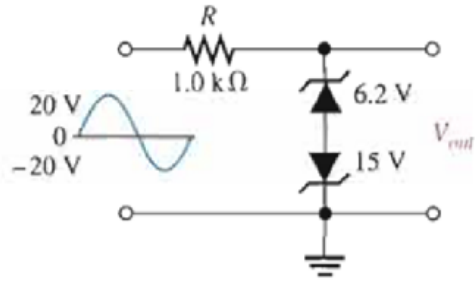


Figure (2)
(5 marks)

Question (2) (10 Marks)

For the transistor shown in figure (3), find **Ic , I_B , I_E, Vc , V_B, V_E,V_{CE}, V_{BE}, V_{CB}** if **β =150**.

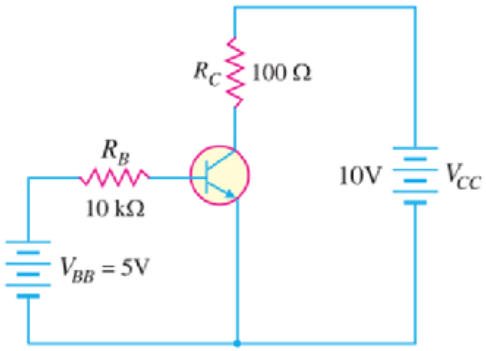


Figure (3)
(10 marks)

Question (3) (20Marks)

(a) Draw the logic diagram for the Boolean function (F= AB+BC+AC)
(b) Draw only the symbol of AND , OR , NOT , XNOR and XOR gates
(c) Design OPAMP circuit to achieve the function Vout/Vin = +0.5
(d) Design OPAMP circuit to achieve the function V_{out} = − (3V_1+2V_2)

Model Answer

Q1-a

$$I_{ZM} = \frac{P_{D(max)}}{V_Z} = \frac{1\text{ W}}{10\text{ V}} = 100\text{ mA}$$

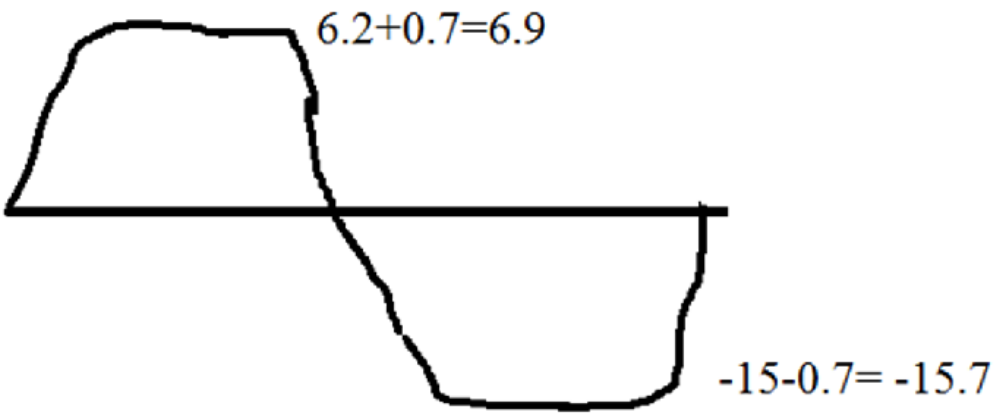
$$V_R = I_{ZK}R = (0.25\text{ mA})(220\ \Omega) = 55\text{ mV}$$

$$V_{IN(min)} = V_R + V_Z = 55\text{ mV} + 10\text{ V} = 10.055\text{ V}$$

$$V_R = I_{ZM}R = (100\text{ mA})(220\ \Omega) = 22\text{ V}$$

$$V_{IN(max)} = 22\text{ V} + 10\text{ V} = 32\text{ V}$$

Q1-b



Q2

$$I_B = \frac{V_{BB} - V_{BE}}{R_B} = \frac{5\text{ V} - 0.7\text{ V}}{10\text{ k}\Omega} = \mathbf{430\ \mu A}$$

$$I_C = \beta_{DC}I_B = (150)(430\ \mu\text{A}) = \mathbf{64.5\text{ mA}}$$

$$I_E = I_C + I_B = 64.5\text{ mA} + 430\ \mu\text{A} = \mathbf{64.9\text{ mA}}$$

Solve for V_{CE} and V_{CB}.

$$V_{CE} = V_{CC} - I_CR_C = 10\text{ V} - (64.5\text{ mA})(100\ \Omega) = 10\text{ V} - 6.45\text{ V} = \mathbf{3.55\text{ V}}$$

$$V_{CB} = V_{CE} - V_{BE} = 3.55\text{ V} - 0.7\text{ V} = \mathbf{2.85\text{ V}}$$

Since the collector is at a higher voltage than the base, the collector-base junction is reverse-biased.

IC = 64.5 mA

IB= 430uA

IE = 64.9mA

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VE=0

VB=0.7 V

VC = 3.55 V

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VBE = 0.7V

VCE=3.55 V

VCB = 2.85 V

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Q3

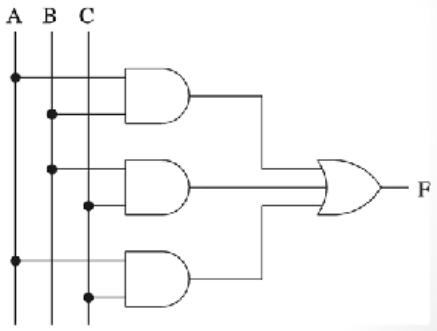
a) ..

3-input majority function

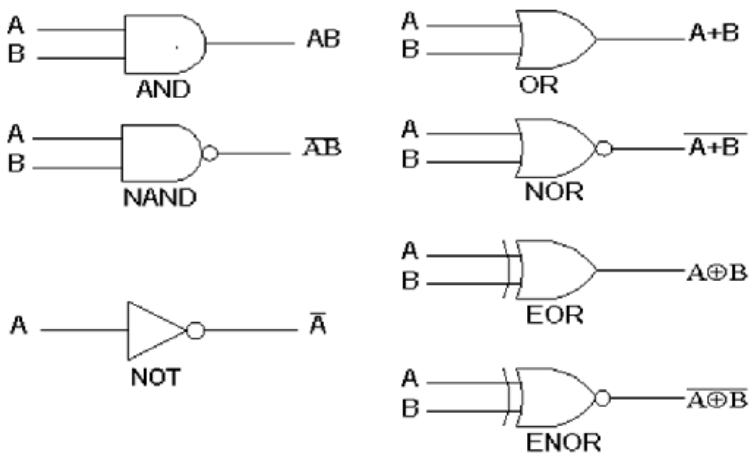
A	B	C	F
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

- Logical expression form

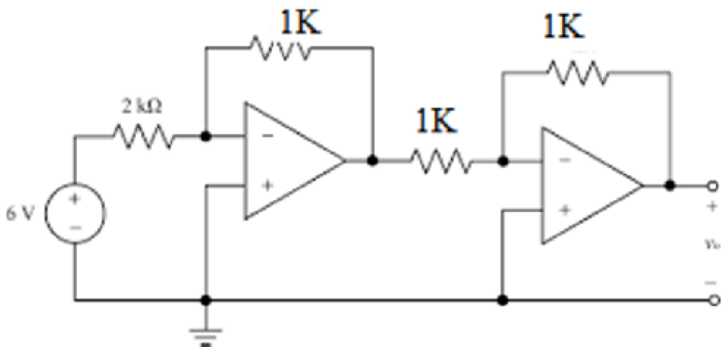
$F = A\,B + B\,C + A\,C$



b) ..



c) ..



1st stage

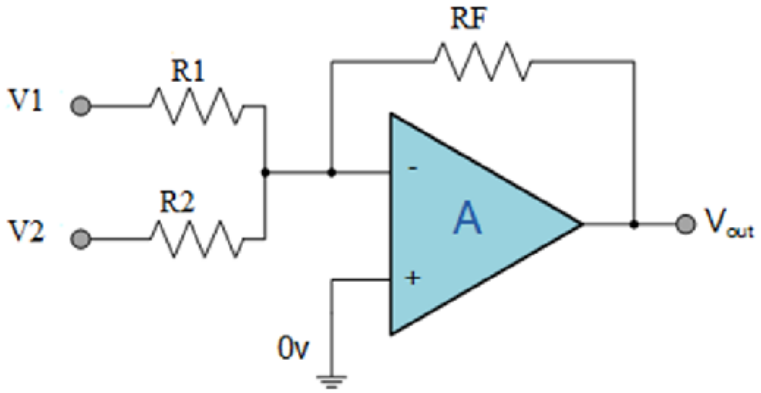
Vo1 / Vin = - Rf1/R1 = -0.5

2nd stage

Vo/ Vo1 = -1

Total gain = 1st * 2nd = +0.5

d)..



Vo = - (RF/R2 * V2 – RF/R1*V1) = - (3V1 + 2V2)

So RF/R2 = 3 ➔ let Rf =6KΩ & R2 = 2KΩ

RF/R1 = 2 ➔ RF=6KΩ & R1 = 3KΩ