Lista II – EN2602 Prof Marcelo Perotoni

1. For the fixed-bias configuration of Fig. 4.73, determine:

(a) I_{B_Q}.
(b) I_{C_Q}.
(c) V_{CE_Q}.
(d) V_C.
(e) V_B.
(f) V_E.

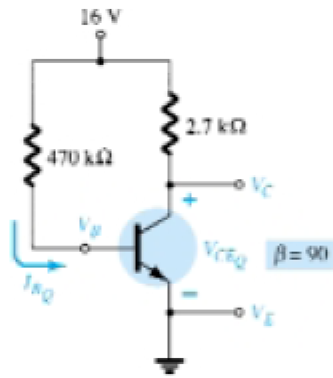

Figure 4.73 Problems 1, 4, 11, 47, 51, 52, 53

(a) Ib=32.5uA (b) Ic=2.92mA (c) VCE=8.11 (d) VC=8.11 (e) VB=0.725 (f) VE=zero

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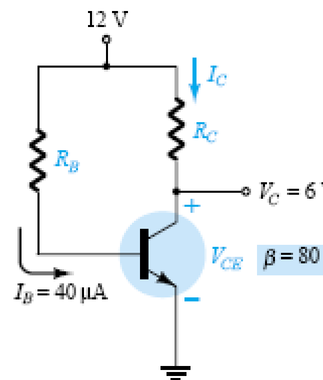

Figure 4.74 Problem 2

2. Given the information appearing in Fig. 4.74, determine:

(a) I_C.
(b) R_C.
(c) R_B.
(d) V_{CE}.

(a) Ic=3.2mA (b) Rc=1.875K (c) RB=282.5K (d) VCE=6V

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4. Find the saturation current ($I_{C_{sat}}$) for the fixed-bias configuration of Fig. 4.73.

(a) ICsat=5.92mA

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* **5.** Given the BJT transistor characteristics of Fig. 4.76:

(a) Draw a load line on the characteristics determined by $E = 21$ V and $R_C = 3$ kΩ for a fixed-bias configuration.
(b) Choose an operating point midway between cutoff and saturation. Determine the value of R_B to establish the resulting operating point.
(c) What are the resulting values of I_{C_Q} and V_{CE_Q}?
(d) What is the value of β at the operating point?
(e) What is the value of α defined by the operating point?
(f) What is the saturation ($I_{C_{sat}}$) current for the design?
(g) Sketch the resulting fixed-bias configuration.
(h) What is the dc power dissipated by the device at the operating point?
(i) What is the power supplied by V_{CC}?
(j) Determine the power dissipated by the resistive elements by taking the difference between the results of parts (h) and (i).

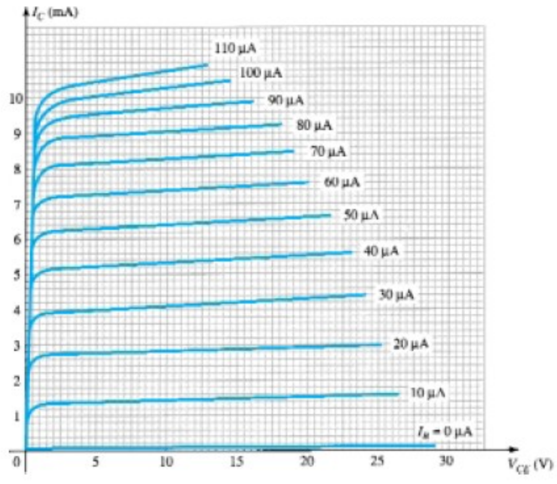


Figure 4.76 Problems 5, 10, 19, 35, 36

(a) Reta com ponto de saturação 7mA e corte 21V (b) RB=812K considerando IB=25uA (c) IC=3.67mA (d)beta=146.8 (e) alfa=0.99 (f) ICsat=7mA (g) Rb=812K e Rc=3K (h) Ptrans=VCE.IC=36.7mW (i) VCC.IC=77mW (j) Presistores=Pfonte-Ptransistores=40mW

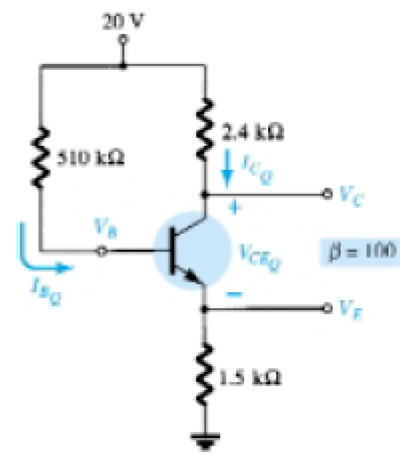


Figure 4.77 Problems 6, 9, 11, 20, 24, 48, 51, 54

6. For the emitter-stabilized bias circuit of Fig. 4.77, determine:

(a) I_{B_Q}.
(b) I_{C_Q}.
(c) V_{CE_Q}.
(d) V_C.
(e) V_B.
(f) V_E.

(a) IBq=29.18uA (b) Icq=2.42mA (c) VCEq=8.61V (d) Vc=Vcc-IC.RC=1.3V (e)VB=VCC-IB.RB=5.12V (f)VE=4.39V

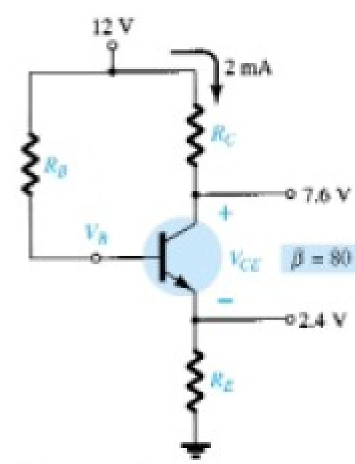
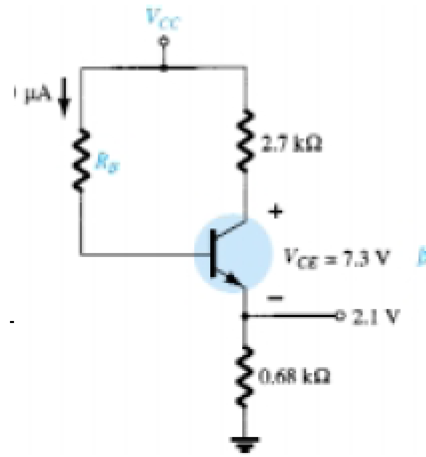


Figure 4.78 Problem 7

7. Given the information provided in Fig. 4.78, determine:

(a) R_C.
(b) R_E.
(c) R_B.
(d) V_{CE}.
(e) V_B.

(a)RC=2K2 (b)RE=1K2 (c)IB=25uA (d)VCE=5.2 (e)VB=3.1



8. Given the information provided in Fig. 4.79, determine:
   (a) β.
   (b) V_{CC}.
   (c) R_B.

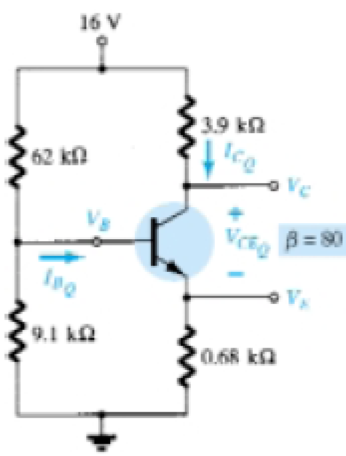
Figure 4.79 Problem 8

Observação – corrente na base = 20uA (foi cortada na figura)

(a) Beta=154.5 (b) VCC=17.5 (c) RB=735K

9. Determine the saturation current ($I_{C_{sat}}$) for the network of Fig. 4.77.

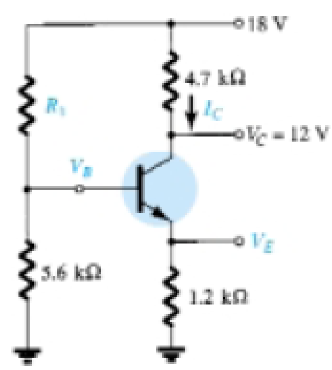
Icsat=5.12mA



12. For the voltage-divider bias configuration of Fig. 4.80, determine:
    (a) I_{B_Q}.
    (b) I_{C_Q}.
    (c) V_{CE_Q}.
    (d) V_C.
    (e) V_E.
    (f) V_B.

Figure 4.80 Problems 12, 15, 18, 20, 24, 49, 51, 52, 55

(a) IB=21.5uA (b) Icq=1.71mA (c)VCEq=8.16 (d) VC=9.32 (e)VE=1.16 (f)VB=1.86



13. Given the information provided in Fig. 4.81, determine:
    (a) I_C.
    (b) V_E.
    (c) V_B.
    (d) R_1.

Figure 4.81 Problem 13

Observação – R2 = 5K6 (figura com definicao deficiente)

(a)Ic=1.27mA (b) VE=1.52 (c) VB=2.22 (d) R1=39K8

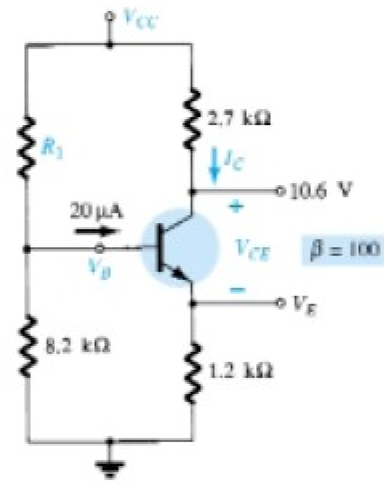


Figure 4.82 Problem 14

14. Given the information appearing in Fig. 4.82, determine:
(a) I_C.
(b) V_E.
(c) V_{CC}.
(d) V_{CE}.
(e) V_B.
(f) R_1.

(a) Ic=2mA (b) VE=2.4V (c) VCC=16V (d)VCE=8.2V (e) VB=3.1 (f) R1=32K4

15. Determine the saturation current ($I_{C_{sat}}$) for the network of Fig. 4.80.

Icsat=3.49mA

* **16.** Determine the following for the voltage-divider configuration of Fig. 4.83 using the approximate approach if the condition established by Eq. (4.33) is satisfied.
(a) I_C.
(b) V_{CE}.
(c) I_B.
(d) V_E.
(e) V_B.

* **17.** Repeat Problem 16 using the exact (Thévenin) approach and compare solutions. Based on the results, is the approximate approach a valid analysis technique if Eq. (4.33) is satisfied?

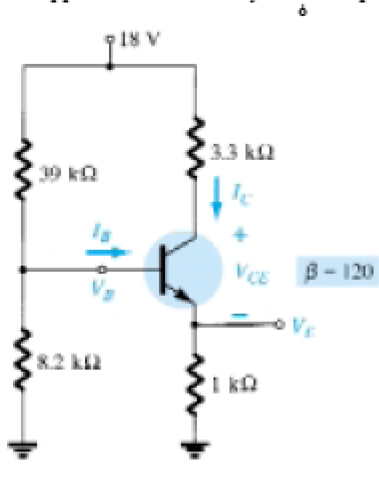
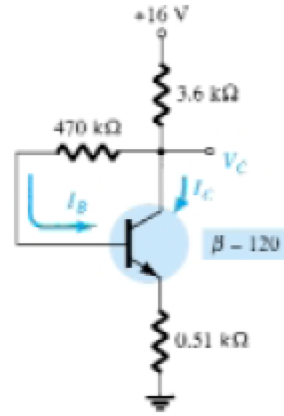


Figure 4.83 Problems 16, 17, 21

[16] (a) VB=3.13V IC=2.43mA (b) VCE=7.55 (c) IB=20.25uA (d)VE=2.43 (e)VB=3.13
[17] (a) IC=2.28mA (b) VCE=8.2 (c) IB=19.02uA (d)VE=2.28 (e)VB=2.98



22. For the collector feedback configuration of Fig. 4.84, determine:
   (a) I_B.
   (b) I_C.
   (c) V_C.

Figure 4.84 Problems 22, 50, 56

(a) IB=15.88uA (b) IC=1.91mA (c) VC=VCC-IC.RC=9.12V

changes in β?

25. Determine the range of possible values for V_C for the network of Fig. 4.87 using the 1-MΩ potentiometer.

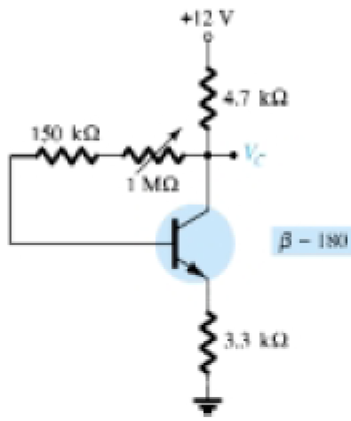
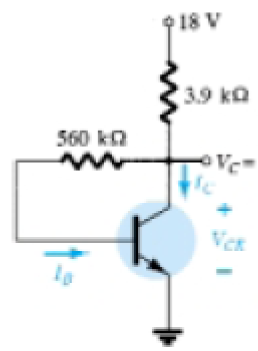


Figure 4.87 Problem 25

(a) IB=7.11uA IC=1.28mA VC=5.98V (b) RB=11.5M pot completo IB=4.36uA IC=beta.IB=0.78mA range VC entre 5.98 e 8.31V



27. Given $V_C = 8$ V for the network of Fig. 4.89, determine:
   (a) I_B.
   (b) I_C.
   (c) β.
   (d) V_{CE}.

Figure 4.89 Problem 27

(a) IB=13.04uA (b) IC=2.56mA (c) beta=196.3 (d) VCE=8V

* **28.** For the network of Fig. 4.90, determine:

(a) I_B.
(b) I_C.
(c) V_{CE}.
(d) V_C.

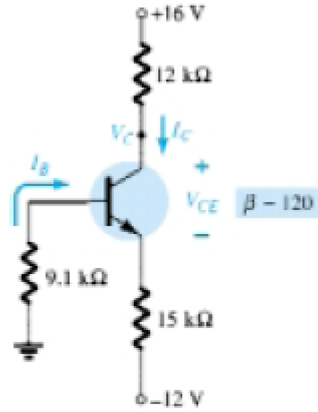


Figure 4.90 Problem 28

(a) IB=6.2uA (b) IC=0.74mA (c) VCE=7.91V (d) VC=VCC-IC.RC=7.07V

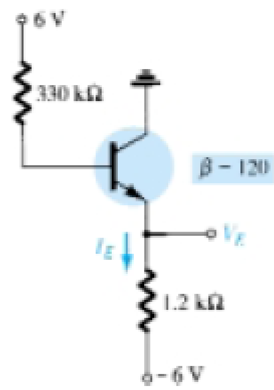
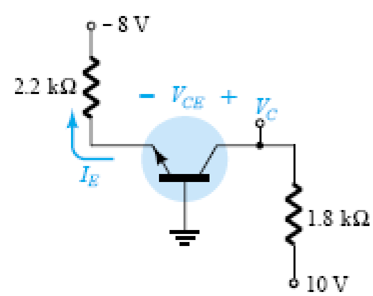


Figure 4.92 Problem 30

* **30.** Determine the level of V_E and I_E for the network of Fig. 4.92.

(a) VE=-2.54V e IE=2.88mA



* **31.** For the network of Fig. 4.93, determine:

(a) I_E.
(b) V_C.
(c) V_{CE}.

Figure 4.93 Problem 31

(a) IE=3.32mA (b)VC=4V (c) VCE=4.72

32. Determine R_C and R_B for a fixed-bias configuration if $V_{CC} = 12$ V, $\beta = 80$, and $I_{C_Q} = 2.5$ mA with $V_{CE_Q} = 6$ V. Use standard values.

RB=361.6K valor coml 360K e RC=2K4

33. Design an emitter-stabilized network at $I_{C_Q} = \frac{1}{2}I_{C_{sat}}$ and $V_{CE_Q} = \frac{1}{2}V_{CC}$. Use $V_{CC} = 20$ V, $I_{C_{sat}} = 10$ mA, $\beta = 120$, and $R_C = 4R_E$. Use standard values.

Valores comerciais RE=390 RC=1k6 RB=430K

34. Design a voltage-divider bias network using a supply of 24 V, a transistor with a beta of 110, and an operating point of $I_{C_Q} = 4$ mA and $V_{CE_Q} = 8$ V. Choose $V_E = \frac{1}{8}V_{CC}$. Use standard values.

Observação – VE = VCC/8 (figura com definicao deficiente)

Valores comerciais RE=750 RC=3K3 R1=43K R2=7K5