TUTORIAL 1
(B.Tech, IInd Sem, Electronics Engg.)

1. If the base current in transistor is 30 μA when the emitter current is 7.2 mA. What are the values of α and β (β=239, α=0.9958)

2. In a CE transistor amplifier circuit V_{CE} is increased from 2 to 12V. the collector current changes from 3 to 4 mA, determine the output resistance. (10 KΩ)

3. In an npn transistor α=0.98, I_E= 10 mA and leakage current I_{CBO}= 1 μA. Determine I_C, I_B and I_{CEO} (9.801mA, 0.199 mA, 50μA)

4. Find the value of base current if the common-base d.c. current gain of a transistor is 0.987 and emitter current is 10 mA. (0.13 mA)

5. The collector and base current of npn transistor are measured as I_C= 5 mA, I_B= 50 μA and I_{CBO}=1 μA.

(i) Determine α, β and I_E (i) α=0.99, β=100 and I_E= 10.1 mA (ii)

(ii) Determine the new level of I_B required to produce I_C= 10mA.

6. The value of β for a transistor is 100. If the value of emitter current is 10 mA, then determine the value of collector and base currents. (I_B = 0.099 mA, I_C= 9.9 mA)

7. The value of α for a transistor is 0.95. Find value of β. Also find the value of α if β changes to 100. (β=19, α=0.99)

8. Given that α_{dc}= 0.987 determine the corresponding value of β_{dc}. (75.92)

9. Given β_{dc}=120, determine the corresponding value of α. (0.9917)

10. An npn transistor connected in CE configuration has β=100 and base to collector leakage current I_{CBO}=4 μA. Calculate I_C if I_B=40 μA. (4.404 mA)

11. A transistor has ΔI_C=1.8 mA for ΔI_E=1.89 mA, what change in I_B will produce an equivalent change in I_B (90μA)

12. A transistor is connected in CB configuration, when the emitter voltage is changed by 200mV, the emitter current changes by 5 mA. During this variation, the collector to base voltage is kept fixed. Calculate the dynamic input resistance of transistor. (40 Ω)

13. If the emitter current of a transistor is 8 mA and I_B is 1/100 of I_C, determine I_C and I_B.

(I_C=7.92mA, I_B=0.08 mA)

14. Find I_E if I_B=40 μA and α_{dc} is 0.98. (2 mA)

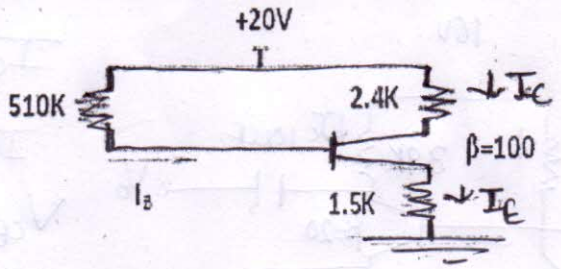
15. In CB configuration, collector current is 0.96 mA and base current is 40 μA. Determine α and I_E. (α=0.96, I_E=1 mA)

$= (1+\beta)\, I_B$

$I_C = \beta I_B$

TUTORIAL NO. 2

Q1. Determine I_B, I_C, V_E, V_C, V_B and V_{CE} for the following circuit.



$I_B = 29.176\ \mu A$

$I_C = 2.9176\ mA$

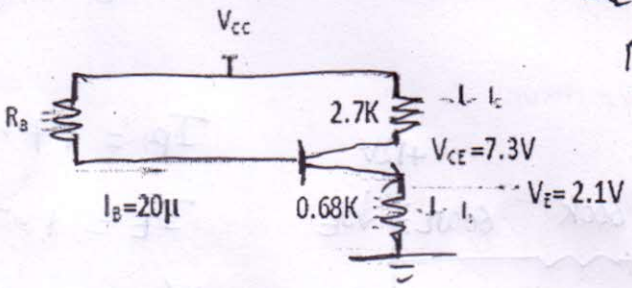
$I_E = 2.9467\ mA$

$V_E = 4.42\ V$

$V_{CE} = 8.577\ V$

$V_B = 5.12\ V$, $V_C = 12.997\ V$, $V_{BC} = -7.877\ V$.

Q2. Find the value of β, V_{CC} and R_B for the following circuit.



$I_E = 3.088\ mA$

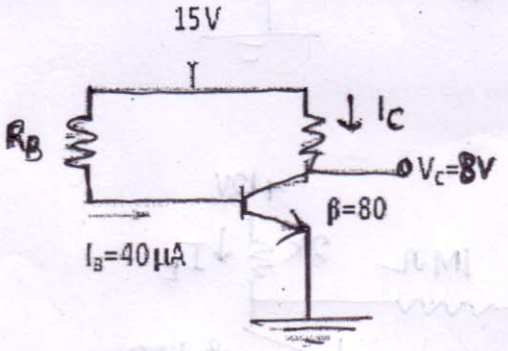
$\beta = 153.4$

$I_C = 3.068\ mA$

$V_{CC} = 17.68\ V$

$R_B = 744\ K\Omega$.

Q3. Determine following for the given circuit. Assume it silicon transistor: (i) I_C (ii) V_{CE} (iii) R_C (iv) R_B



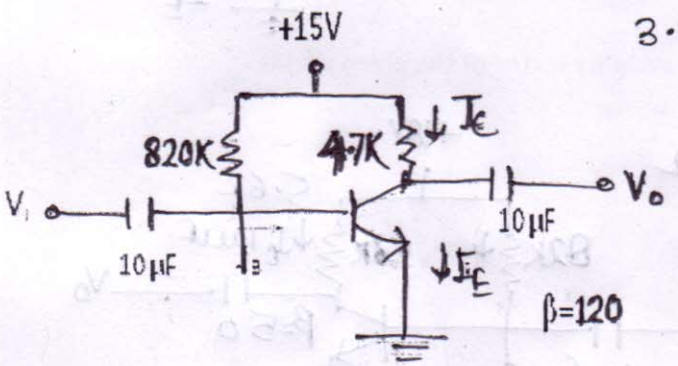
$I_C = 3.2\ mA$

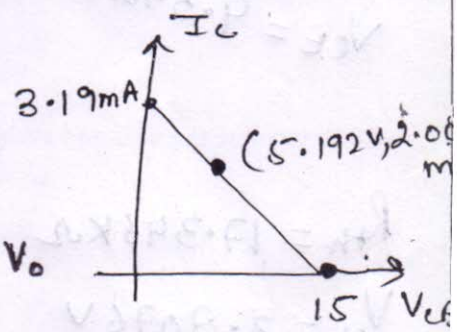
$R_C = 2.187\ K\Omega$

$R_B = 357.5\ K\Omega$

$V_{CE} = 8\ V$

Q4. Draw the dc load line and locate the operating point for the circuit shown in fig. What will be its stability factor? V_{BE}=0.7V





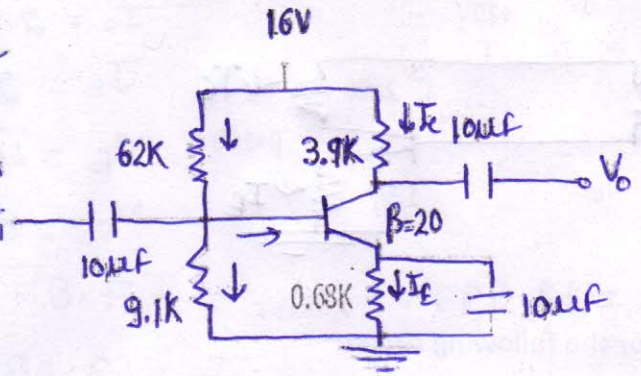
$I_B = 17.439\ \mu A$

$I_C = 2.0868\ mA$

$V_{CE} = 5.192\ V$

$S = 121$

Q5.Determine following for the given circuit .Assume it silicon transistor: (i) I_{BQ} and I_{CQ} (ii) V_{CEQ}(iii) V_E & V_C



$R_{Th} = 7.935\,K\Omega$

$V_{Th} = 2.047V$

$I_{BQ} = 60.634\,\mu A$

$I_{CQ} = 1.212\,mA$

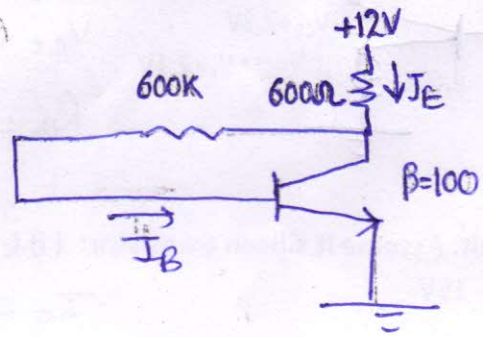
$I_E = 1.273\,mA$

$V_{CE} = 10.407V$

$V_E = 0.865\,V$

$V_C = 11.272\,V$

Q6.Determine I_E and V_C for the given circuit.



~~$I_B = 18.165\,\mu A$~~

~~$I_C = 1.8165\,mA$~~

~~$I_E = 1.8346\,mA$~~

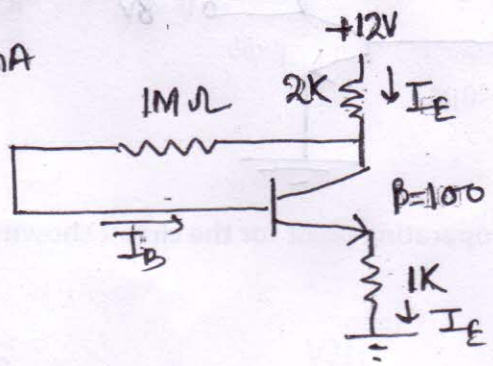
~~$V_C = 10.899V$~~

$I_B = 17.105\,\mu A$

$I_E = 1.7276\,mA$

$V_{CE} = 10.96V$

Q7. Determine I_E, I_B, I_C and V_{CE} for the given circuit.



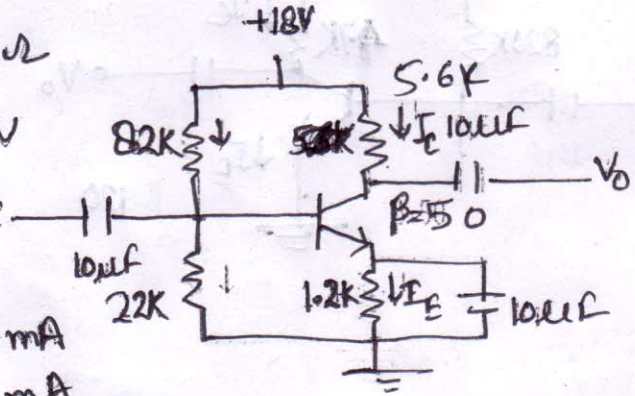
$I_B = 8.672\,\mu A$

$I_E = 0.8759\,mA$

$I_C = 0.8672\,mA$

$V_{CE} = 9.372V$

Q8.Determine Q-point and stability factor of the given circuit .



$R_{Th} = 17.346\,K\Omega$

$V_{Th} = 3.8076V$

$I_B = 39.56\,\mu A$

$I_E = 2.0177\,mA$

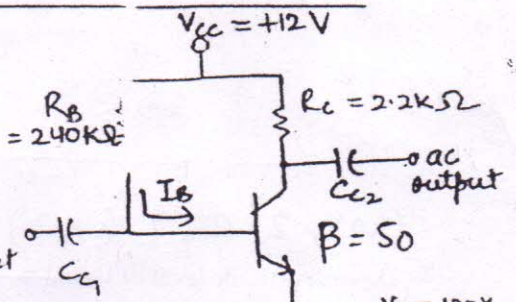
$I_C = 1.978\,mA$

$V_{CE} = 4.501\,V$

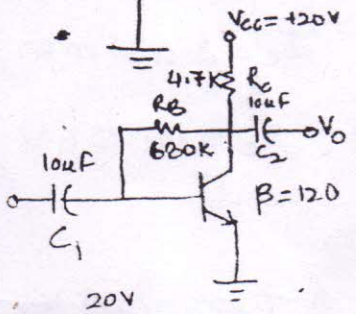
GLA University

I year | Tutorial-2 | Electronics Engineerir ;

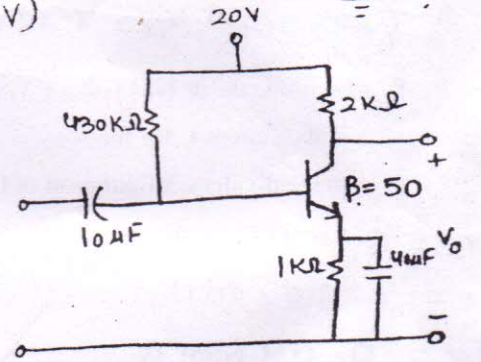
1. Determine the following for the fixed-bias configuration.
   a. I_{BQ} and I_{CQ}
   b. V_{CEQ}
   c. V_B and V_C
   d. V_{BC} (47.08uA, 2.35mA, 6.82V, 0.7V, 6.82V) -6.12V.



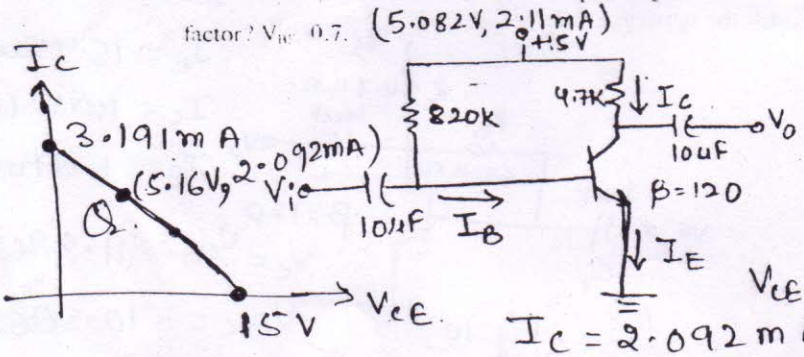
2. For the network determine
   a. V_{CQ} = 11.213V I_B = 0.01545 mA or = 15.45 μA
   b. V_{CEQ} = 11.213V
   c. V_B = 0.7V I_C = 1.8547 mA
   d. V_{BC} = −10.513V I_E = 1.8694mA
   e. V_E = 0V
   f. ~~V_{TH}~~ (0.725V, 0.725V, 0.7V, 0.725V, 0V, −0.025V)



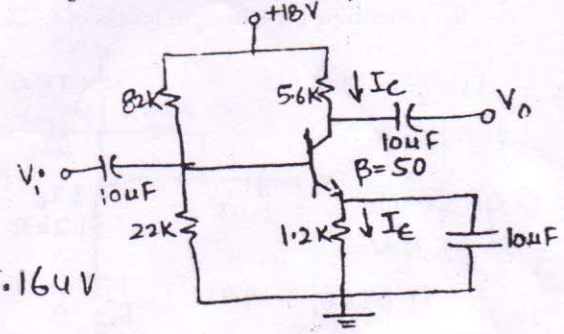
3. For the emitter bias network determine:
   a. I_B = ~~0.04012 mA~~ = 40.12 μA
   b. I_C = 2.006 mA, I_E = 2.046 mA
   c. V_{CE} = 13.94 V
   d. V_C = 15.98 V
   e. V_E = 2.046 V V_{BC} = −13.23 V
   f. V_B = 2.746 V
   g. V_{BC} (36.27 uA, 1.81mA, 14.53V, 16.38V, 1.85V, 2.55V, −13.83V)



4. Draw the dc load line and locate the operating for the circuit shown in fig.4 What will be its stability factor? V_{BE} 0.7. (5.082V, 2.11mA)



V_{CE} = 5.164V
I_C = 2.092 mA,



5. Determine the levels of I_{CQ} and V_{CEQ} for the voltage-divider configuration. (1.98 mA, 4.5V)
6. The load line is given in the fig.6 and the Q point is defined.

Q5 (Ans)

R_{th} = 17.346KΩ
V_{th} = 3.807V

I_{BQ} = 0.03955 mA = 39.55 μA V_{CEQ} = 4.508V.
I_{CQ} = 1.977mA
I_{EQ} = 2.017mA

Determine the required values of V_{CC}, R_C and R_B for a fixed bias configuration.

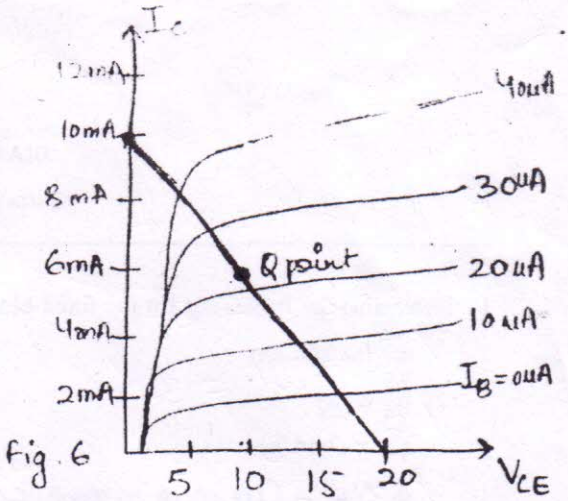


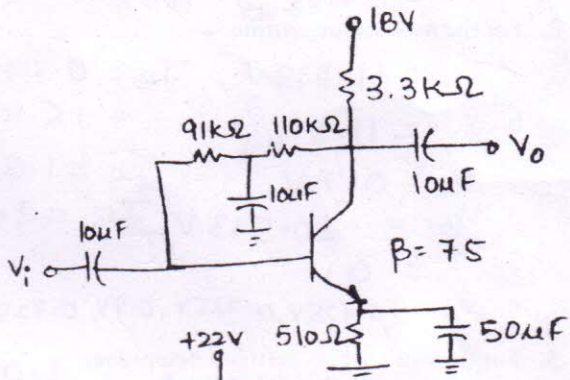
Fig. 6

(20V, 2kΩ, 772kΩ)

7. Determine the dc level of I_B and V_C for the network.

$I_C = 2.645mA$, $I_E = 2.680mA$

$V_C = 9.156V$



(I_B=35.26μA, V_{CE} = 7.78V)

8. Determine the dc bias voltage V_{CE} and the current I_C for the voltage-divider configuration of fig.8.

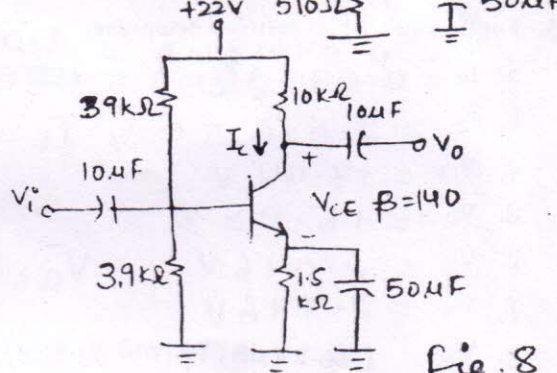


Fig. 8

$I_B = 6.045\mu A$

$I_E = 0.852mA$

$I_C = 0.846mA$

(V_{CE}=12.22V, 0.85mA)

9. Determine the Quiscent levels of I_{CQ} and V_{CEQ} for the network of fig.9.

$I_B = 11.82\mu A$

$I_C = 1.064mA$

$I_E = 1.075mA$

$V_{CE} = 3.657V$

(1.07mA, 3.69V)

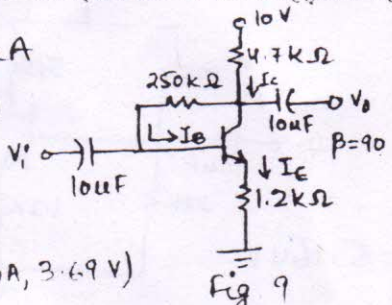


Fig 9

10. For the network of fig.10 determine:

(a) I_{CQ} and V_{CEQ}

(b) V_B, V_C, V_E and V_{BC}

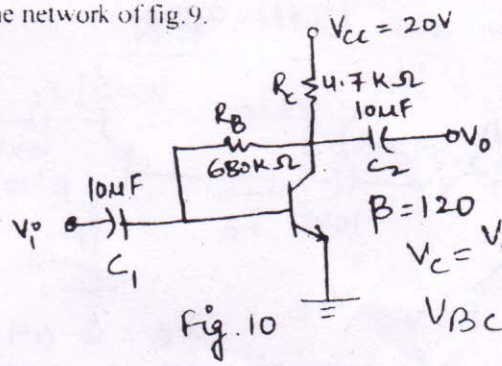


Fig. 10

$I_B = 15.45\mu$

$I_C = 1.854m$

$I_E = 1.870m$

$V_C = V_{CE} = 11.2862$

$V_{BC} = -10.5862$

11. Determine V_C and V_B for the network of fig.11.

$I_B = 83\,\mu A$

$I_C = 3.735\,mA$

$I_E = 3.818\,mA$

$V_E = -9\,V$

$V_c = -4.482\,V$

$V_B = -8.3\,V$

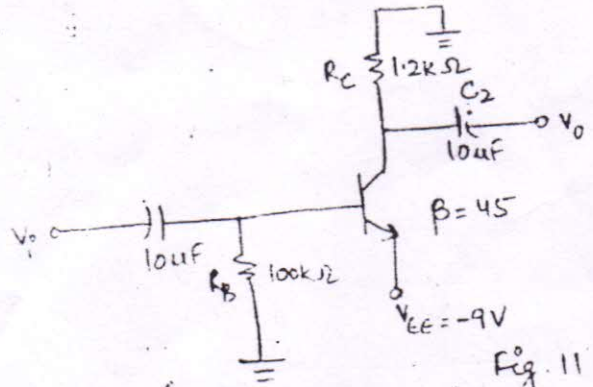


Fig. 11

(-4.43 V, -8.3V)

12. Determine V_{CEQ} and I_C for the network of fig.12.

$I_B = 45.73\,\mu A$

$I_C = 4.116\,mA$

$I_E = 4.161\,mA$

$V_{CE} = 11.678\,V$

(11.68 V, 4.16 mA)

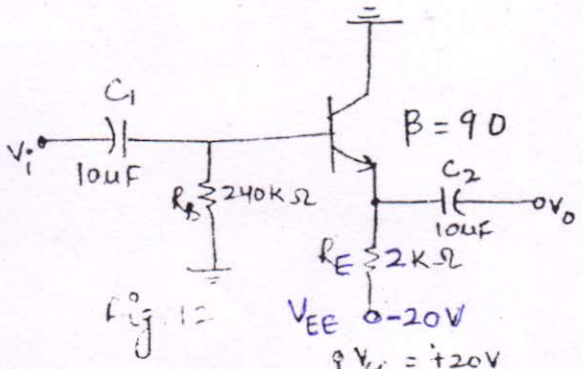


Fig. 12

13. Determine V_C and V_B for the network of fig.13.

Solve Question as Boylested.

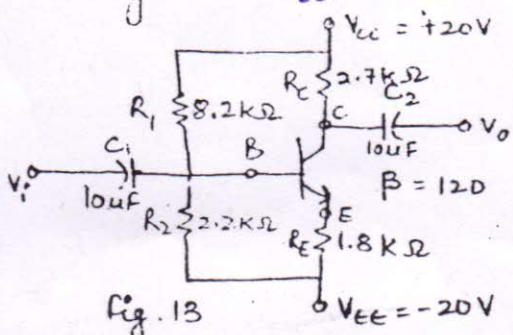


Fig. 13

Q 14 (8.53V, -11.59V)

14. In a CE germanium transistor amplifier, voltage divider is used. Determine the following:

$R_{th} = 14.736K\Omega$

$V_{th} = 4.21V$

$I_B = 26.4\mu A$ (12.55V, 6.63mA, 7.40)

a. The operating point b. The stability factor, S.

15. Fig. 15 shows the collector-to-base bias circuit with β=100.

$I_C = 1.7mA$

$I_E = 1.726mA$

$V_{CE} = 7.27V$

$S = 7.534$

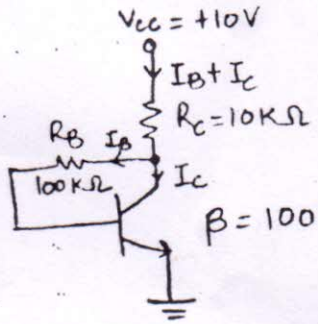
Assuming V_{BE}=0, determine the following:

a. The value of I_B

b. The value of I_C

c. The value of V_{CE}

d. The stability factor



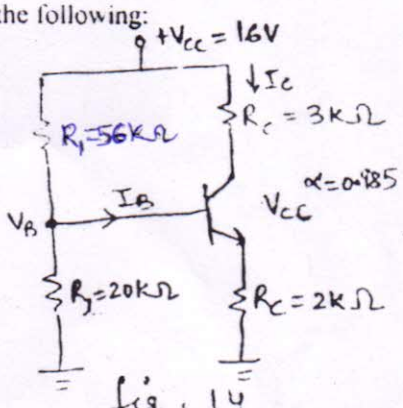


fig. 14

(9μA, 0.9mA, 1V, 92.5)

$I_B = 9.01\,\mu A \approx 9\,\mu A$

$I_C = 0.9m$

$I_E = 0.909m\,A$

$V_{CE} = 0.91\,V$

$S = 10.009$.