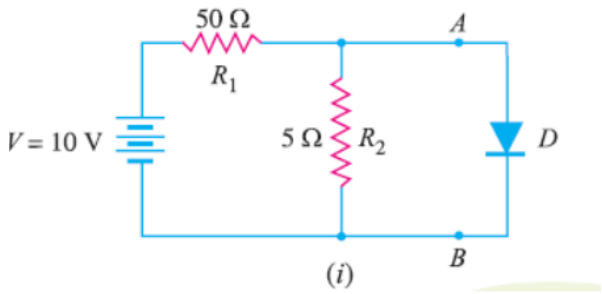
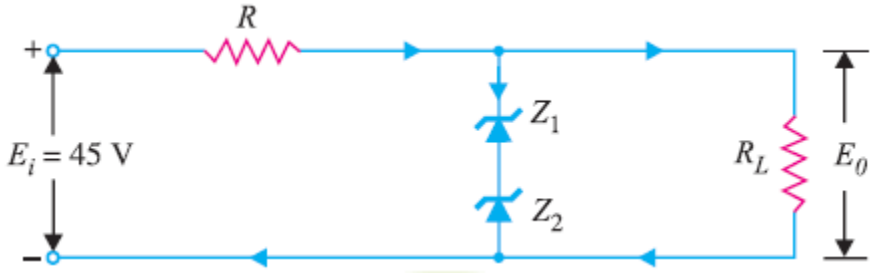
TUTORIALS 1

1. Find the current through the diode in the circuit shown in Figure. Assume the diode to be ideal.

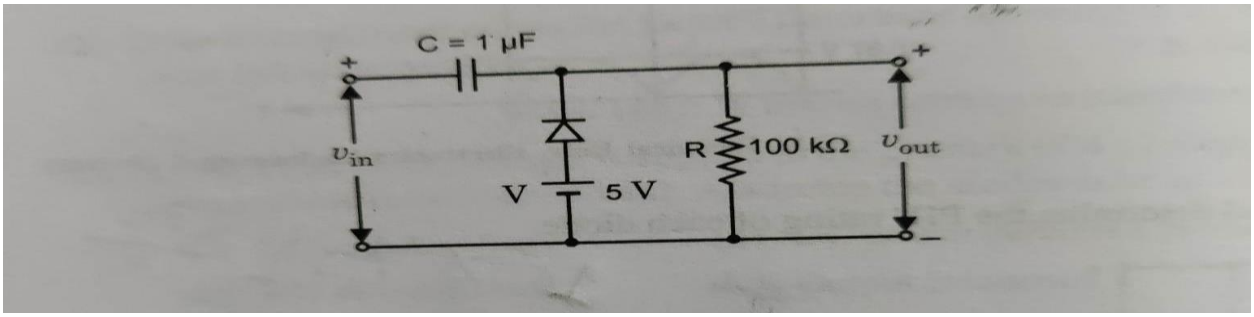


(*i*)

2. A silicon diode has reverse saturation current of 2.5 µA at 300 K. Find forward voltage for a forward current of 10 mA.
3. A silicon diode has a saturation current of 5nA at 25°C. What is the saturation current at 100°C.
4. The circuit uses two Zener diodes, each rated at 15 V, 200 mA. If the circuit is connected to a 45-volt unregulated supply, determine :(i) The regulated output voltage (ii) The value of series resistance R.



5. If input voltage is 15 sinwt find the output waveform.



6. **Example 5.9.** A full-wave bridge rectifier use $R_L = 2$ kΩ, each diode is to have forward resistance $R_F = 2$ Ω and $R_r = \infty$. A sinusoidal voltage having peak amplitude of 20 V is applied. Find out: (*i*) Peak, dc and rms values of load current; (*ii*) dc and rms output voltages; (*iii*) dc output power, (*iv*) ac input power, (*v*) efficiency.

7.

Example 5.9. A full-wave bridge rectifier use $R_L = 2\ k\Omega$, each diode is to have forward resistance $R_F = 2\ \Omega$ and $R_r = \infty$. A sinusoidal voltage having peak amplitude of 20 V is applied. Find out: (*i*) Peak, dc and rms values of load current; (*ii*) dc and rms output voltages; (*iii*) dc output power, (*iv*) ac input power, (*v*) efficiency.

8.

22. Sketch v_0 for the network of Fig. 3.

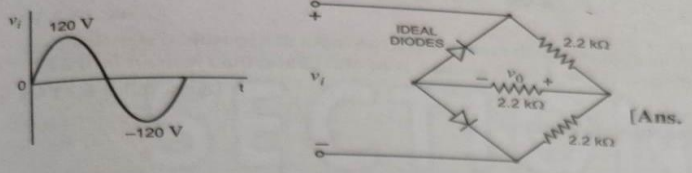
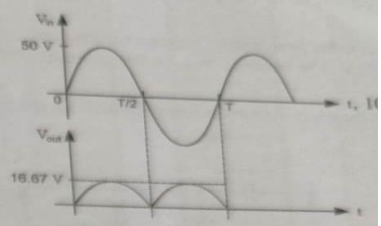


Fig. 3

[Ans.



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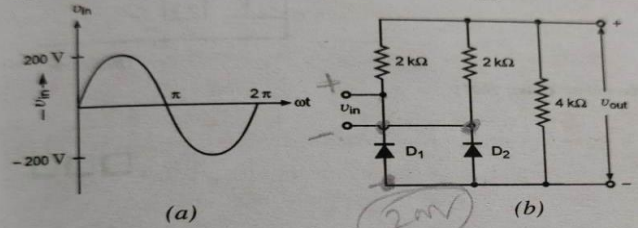
23. For the circuit shown in Fig. 4, sketch V_{out} and determine the PIV rating of each diode.



(a) (b)

Fig. 4

[Ans.

200 V

24. A triangular voltage shown in Fig. 5 is applied to the biased clipper circuit (combination clipper) Determine the wave-shape of the output voltage.

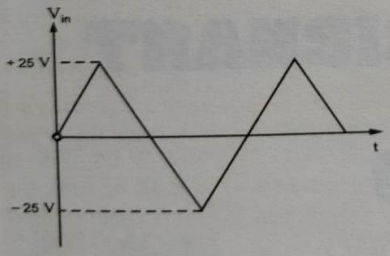


Fig. 5

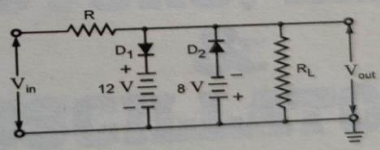
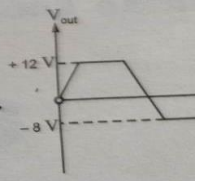
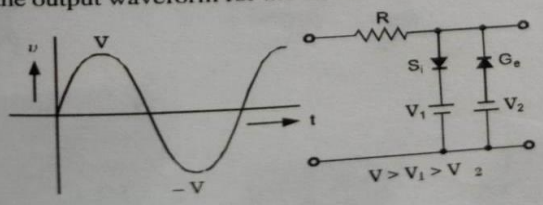


Fig. 6

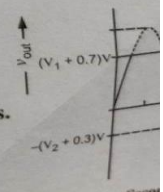
[Ans.



25. Draw the output waveform for the circuit shown in Fig. 7.



[Ans.



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9.

type of supply can be satisfactory for some particular p...

Example 5.1. A sinusoidal voltage of 40 V and frequency 50 Hz is applied to a half-wave rectifier. $R_L = 200\ \Omega$, $V_\gamma = 0$, $R_F = 20\ \Omega$, $R_r = \infty$. Find V_{dc}, I_{dc}, I_{max}, I_{rms}, P_{dc}, η, ripple factor, % regulation. [M.D. Univ. Analog Electronics, May-2006]

Exa... volt...

Draw a dc load line and find Q point for these circuits.

10.

...on if the ... is ignored. ... results will reveal the difference in

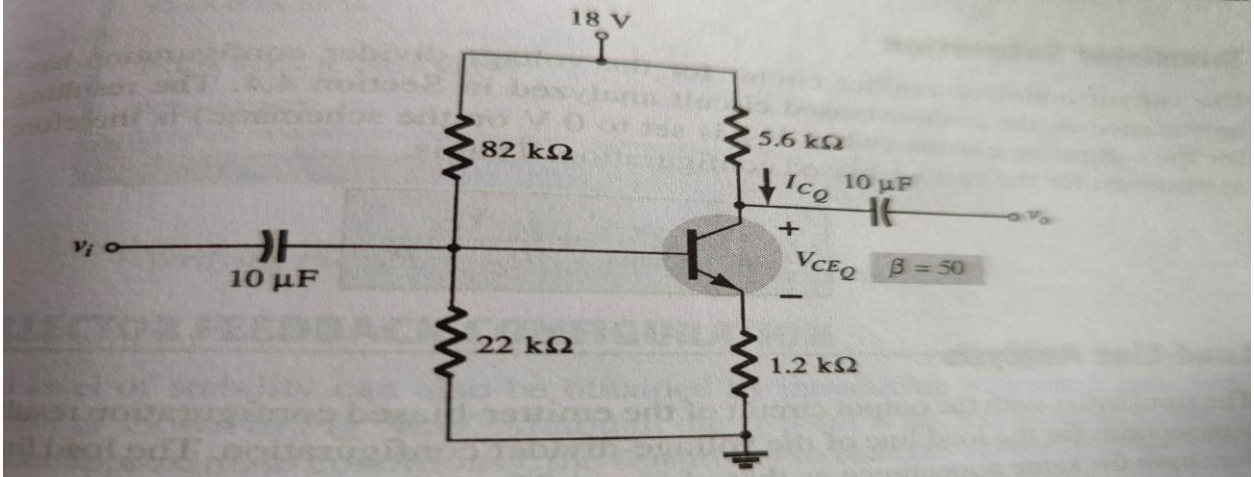


FIG. 4.37

Voltage-divider configuration for Example 4.11.

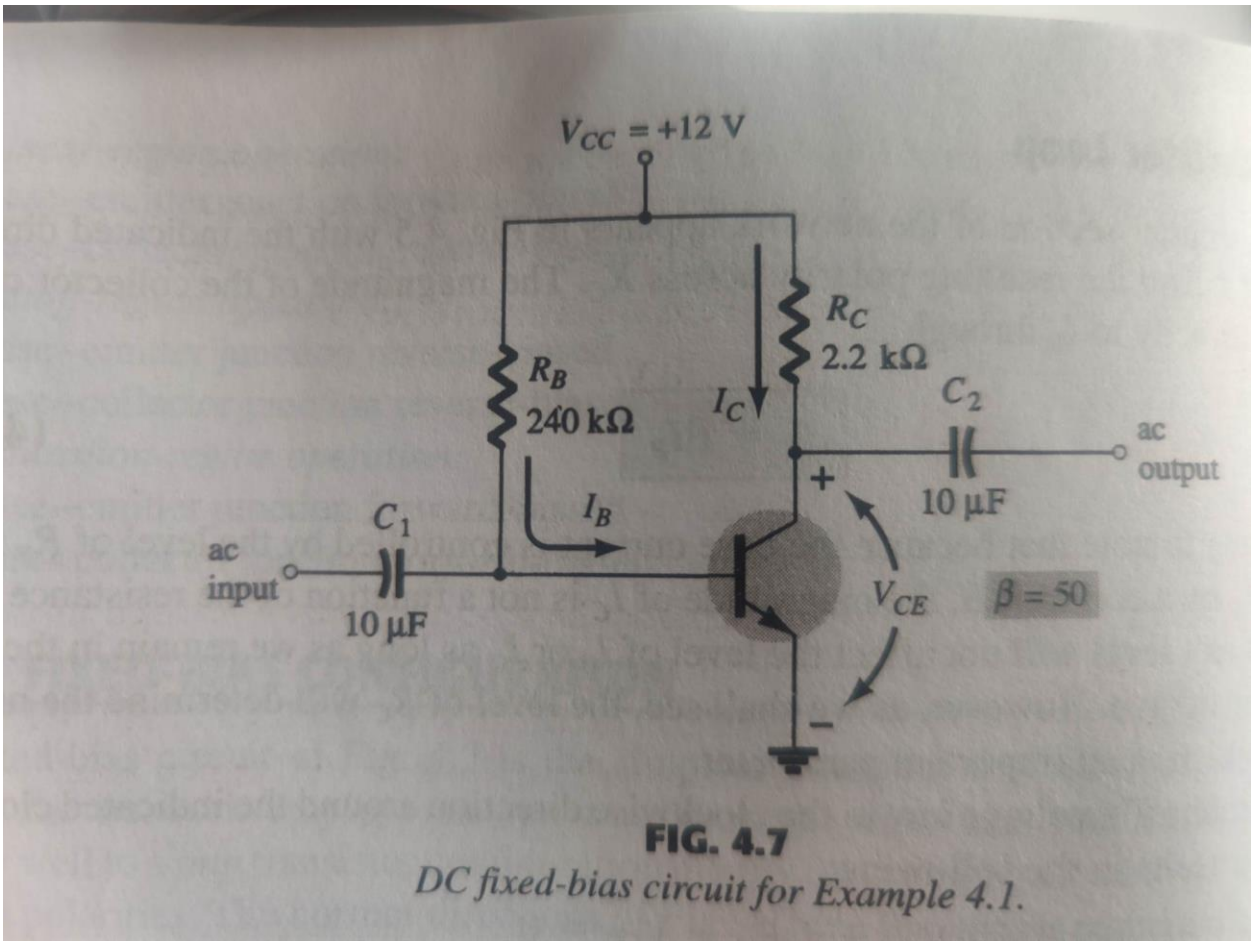


FIG. 4.7

DC fixed-bias circuit for Example 4.1.

11.

12.

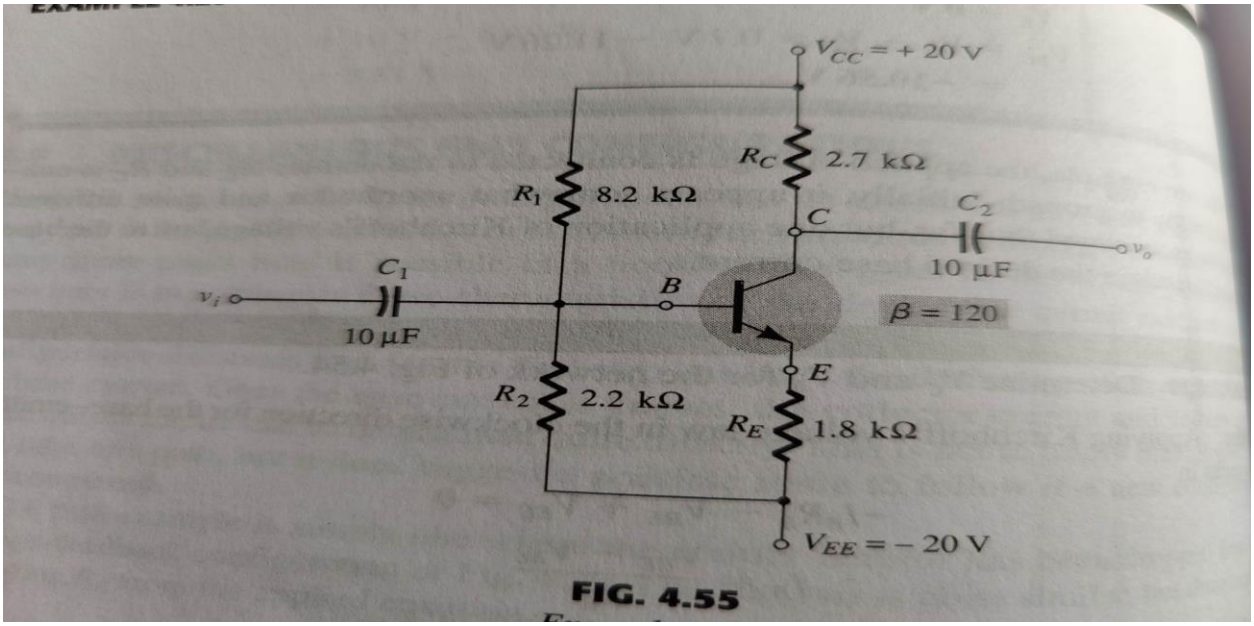


FIG. 4.55

Base voltage, $V_B = V_{CC} - I_B R_B$

Example 7.6. Determine the resistor values for the following network (Fig. 7.11) for the indicated operating point and power supply voltage. *[U.P. Technical Univ. Electronics Engineering Second Semester 2006-07]*

...and its operating point is

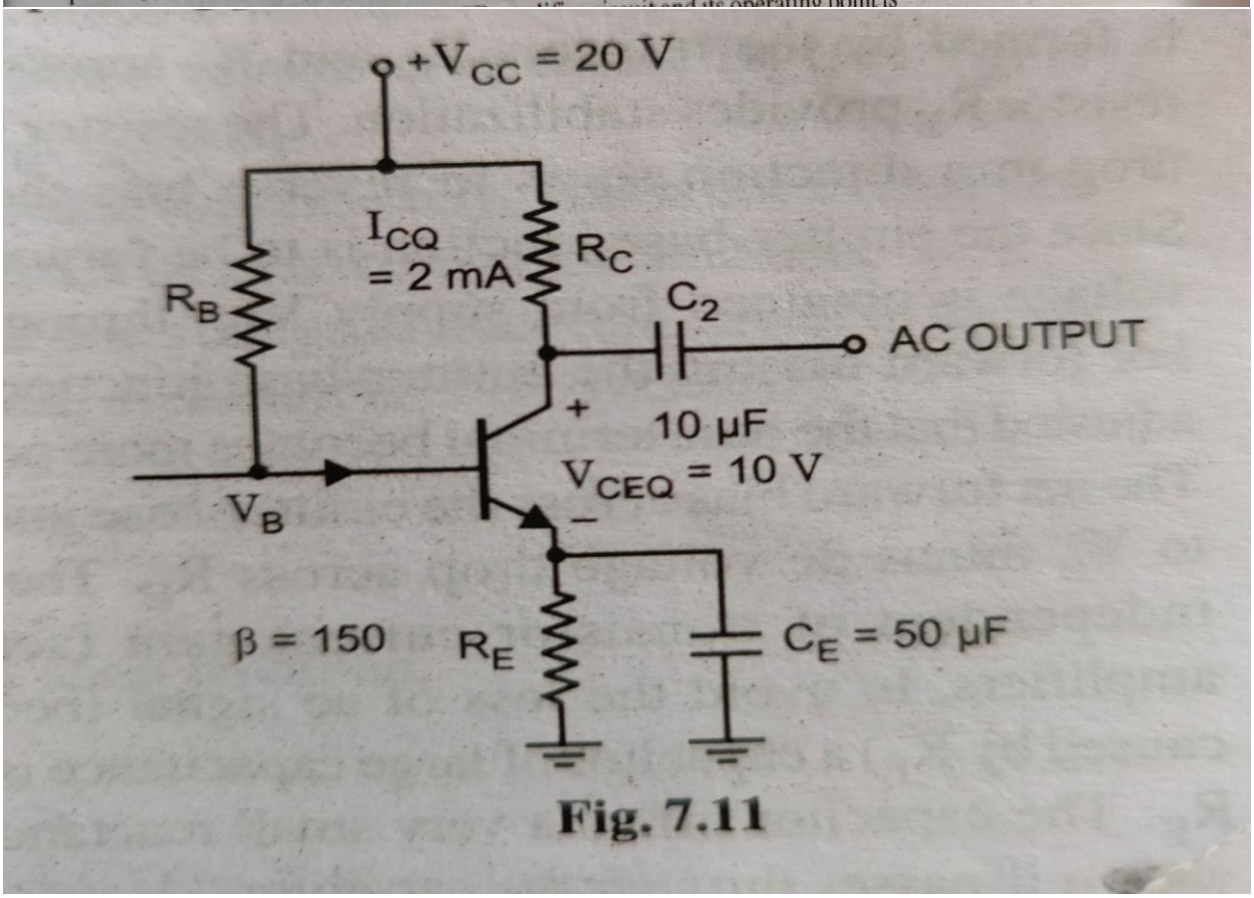
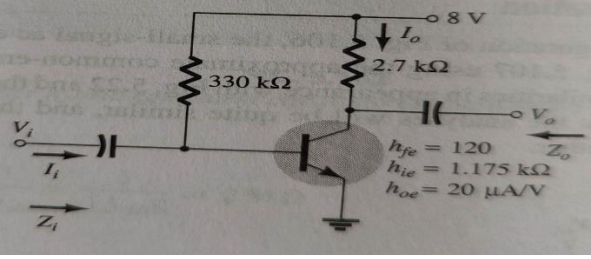


Fig. 7.11

14.

EXAMPLE 5.20 For the network of Fig. 5.108, determine:

a. Z_i.
b. Z_o.
c. A_v.
d. A_i.



15.

EXAMPLE 7.1 Determine the following for the network of Fig. 7.6:

a. V_{GS_Q}.
b. I_{D_Q}.
c. V_{DS}.
d. V_D.
e. V_G.
f. V_S.

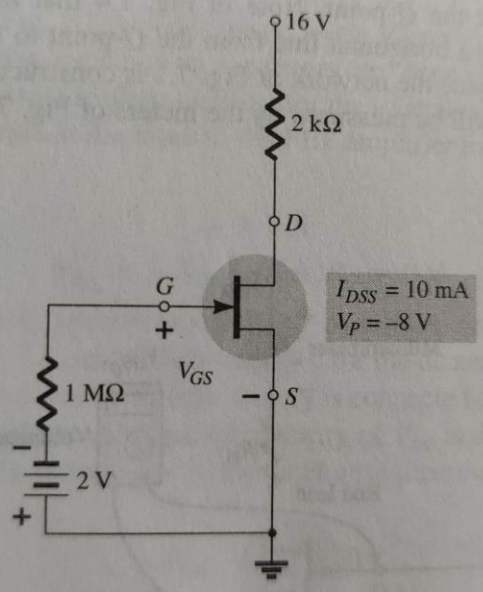


FIG. 7.6
Example 7.1.

16.

EXAMPLE 7.2 Determine the following for the network of Fig. 7.12:

a. V_{GS_Q}.
b. I_{D_Q}.
c. V_{DS}.
d. V_S.
e. V_G.
f. V_D.

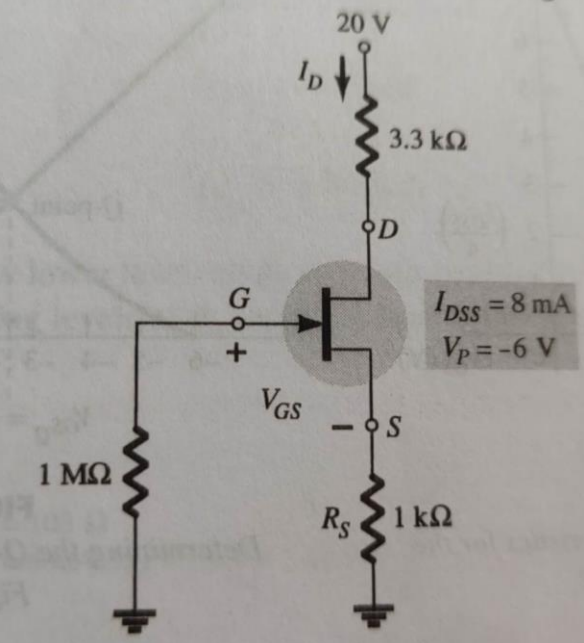


FIG. 7.12
Example 7.2.

17.

$$\text{or } V_{GS\,(OFF)} = \frac{-2I_{DSS}}{g_{mo}} = \frac{-2 \times 10 \times 10^{-6}}{10 \times 10^{-3}} = -2 \text{ mV} \quad \textbf{Ans.}$$

Example 9.9. An N-channel JFET has I_{DSS} = 10 mA and V_P = –4 V. Determine the minimum value of V_{DS} for pinch-off region and drain current I_D for V_{GS} = – 2 V in pinch-off region.

18.

EXAMPLE 5.19 Given $I_E = 2.5$ mA, $h_{fe} = 140$, $h_{oe} = 20\ \mu$S (μmho), and $h_{ob} = 0.5\ \mu$S, determine:

a. The common-emitter hybrid equivalent circuit.
b. The common-base r_e model.

19. 20

EXAMPLE 5.9 For the network of Fig. 5.62, determine:

a. r_e.
b. Z_i.
c. Z_o.
d. A_v.
e. Repeat parts (b) through (d) with $r_o = 20\,k\Omega$ and compare results.

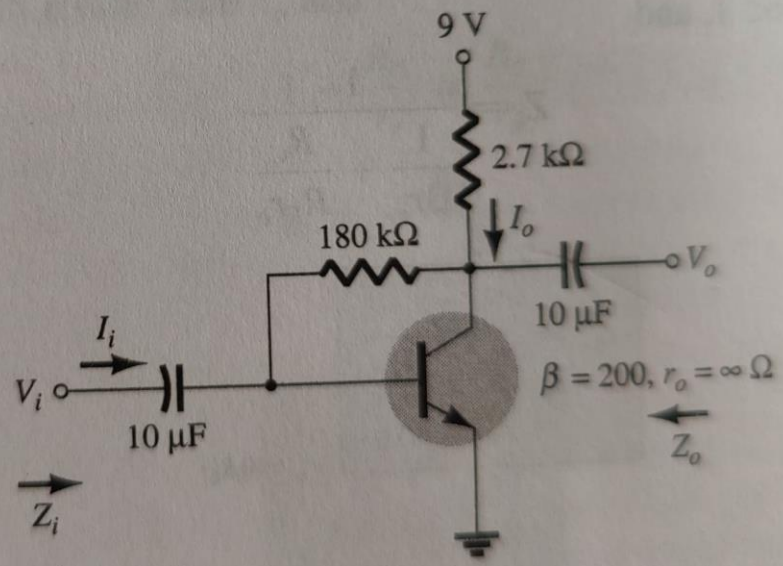
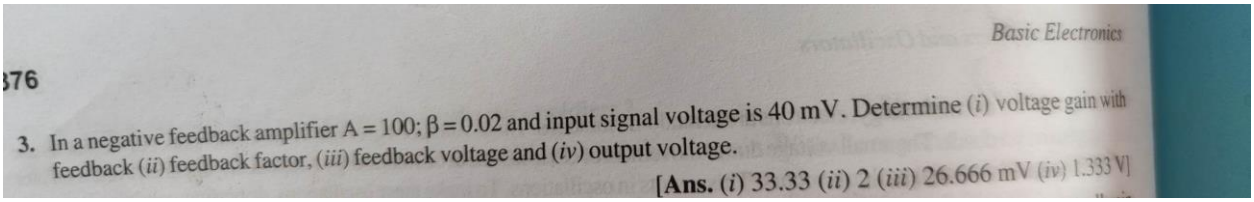


FIG. 5.49
Example 5.9.

20.



3. In a negative feedback amplifier A = 100; β = 0.02 and input signal voltage is 40 mV. Determine (*i*) voltage gain with feedback (*ii*) feedback factor, (*iii*) feedback voltage and (*iv*) output voltage.

[Ans. (*i*) 33.33 (*ii*) 2 (*iii*) 26.666 mV (*iv*) 1.333 V]

21.

EXAMPLE 5.2 For the network of Fig. 5.28, determine:

a. r_e.
b. Z_i.
c. Z_o ($r_o = \infty\ \Omega$).
d. A_v ($r_o = \infty\ \Omega$).
e. The parameters of parts (b) through (d) if $r_o = 50\ \text{k}\Omega$ and compare results.

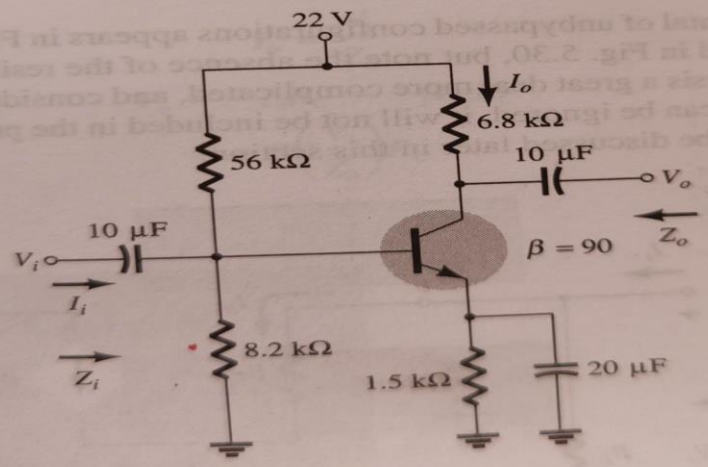


FIG. 5.28

22.

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3. In a negative feedback amplifier A = 100; β = 0.02 and input signal voltage is 40 mV. Determine (*i*) voltage gain with feedback (*ii*) feedback factor, (*iii*) feedback voltage and (*iv*) output voltage.

[Ans. (*i*) 33.33 (*ii*) 2 (*iii*) 26.666 mV (*iv*) 1.333 V]

23., 24

4. To an amplifier of 60 dB gain a feedback (negative) of β = 0.006 is applied. What would be the change in the overall gain of the feedback amplifier if the gain of the amplifier decreases by 15%. **[Ans.** 2.462%]
5. A single-stage amplifier has a voltage gain of 10 and a bandwidth of 1 MHz. Three such stages are cascaded and a negative feed of 10% is applied to the cascade stage. Find the overall voltage gain and bandwidth of the cascaded stage with feedback. **[Ans.** 10; 100 MHz]
6. The resonant circuit of a tuned-collector transistor oscillator has a resonant frequency of 10 MHz. If the value of

25, 26, 27.

capacitance is increased by 40 %, calculate the new resonant frequency.

7. Determine the operating frequency of a Colpitt's oscillator shown in Fig. 11.14 if L = 50 μH, L_{RFC} = 0.8 m C_1 = 0.01 μF, C_2 = 0.02 μF, C_C = 20 μF. **[Ans.** 275 k
8. Determine the oscillation frequency of a transistor Hartley oscillator shown in Fig. 11.16 with circuit val L_1 = 150 μH, L_2 = 1.5 mH, M = 75 μH and C = 150 pF. **[Ans.** 306 k
9. In a Wien bridge oscillator shown in Fig. 11.23 if $R_1 = R_2$ = 110 kΩ and $C_1 = C_2$ = 1,600 pF. Determine frequency of oscillation. **[Ans.** 904

28.

EXAMPLE 7.2 Determine the following for the network of Fig. 7.12:

a. V_{GS_Q}.
b. I_{D_Q}.
c. V_{DS}.
d. V_S.
e. V_G.
f. V_D.

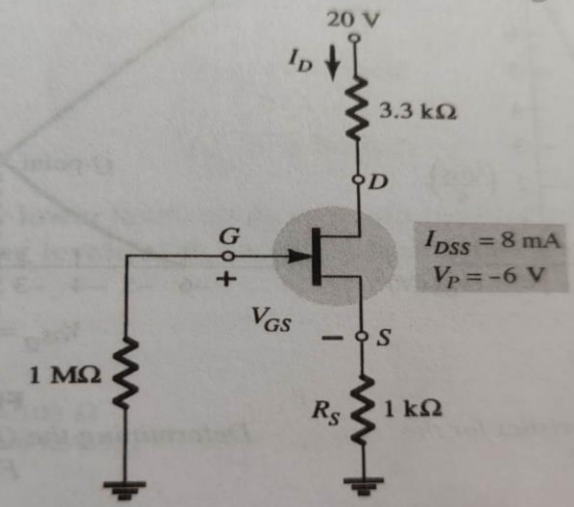

FIG. 7.12
Example 7.2.

29.

b) Find V_1/V_S in the circuit below: ($\beta1=\beta2=100$, $r_{e1}=r_{e2}=25\ \Omega$).