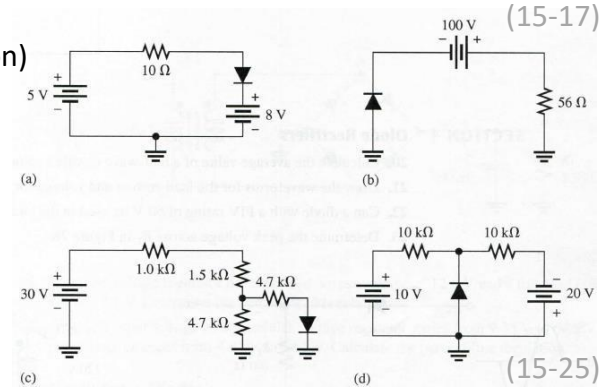
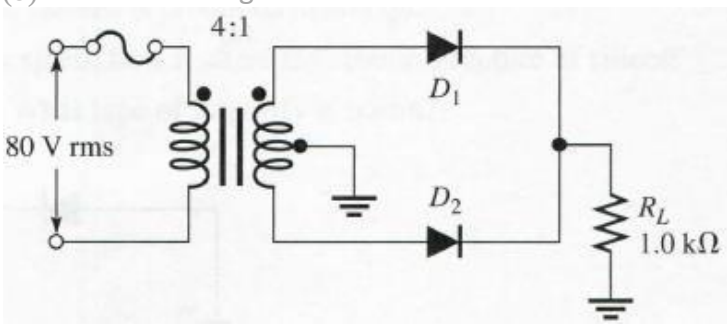
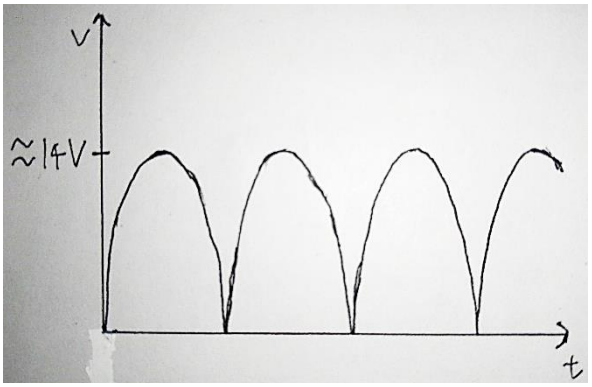
Electronic Circuits Homework 5

1. Determine the voltage across each diode in Figure. (15-17)
   (a) 8-5 = 3 V (b) 0 (c) 0 (d) 10 V (by Superposition)



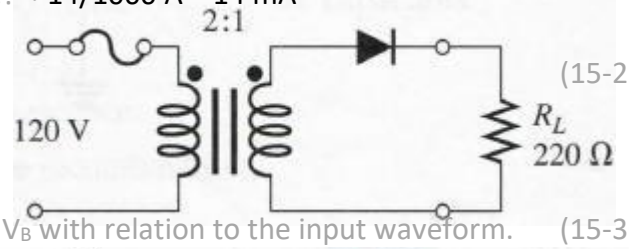
2. Consider the circuit in Figure. (15-25)
   (a) What type of circuit is this? center-tapped full-wave rectifier
   (b) What is the total peak secondary voltage? 80/0.707/4 ≈ 28 V
   (c) Find the peak voltage across each half of the secondary. ≈ 14 V
   (d) Draw the voltage waveform across R_L.



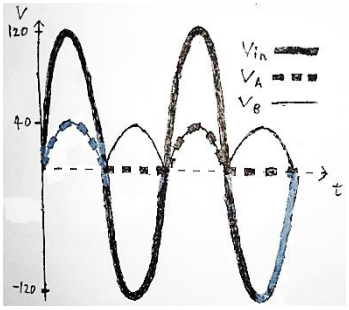


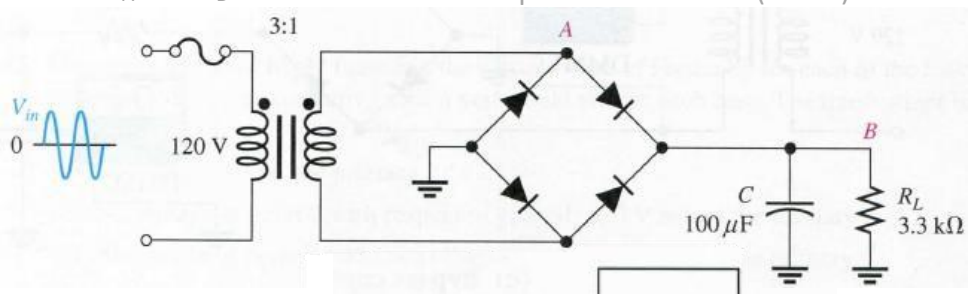
   (e) What is the peak current through each diode? ≈ 14/1000 A = 14 mA
   (f) What is the PIV for each diode? ≈ 28 V

3. Determine the peak voltage across R_L in Figure. (15-23)
   120/2 - 0.7 ≈ 60V



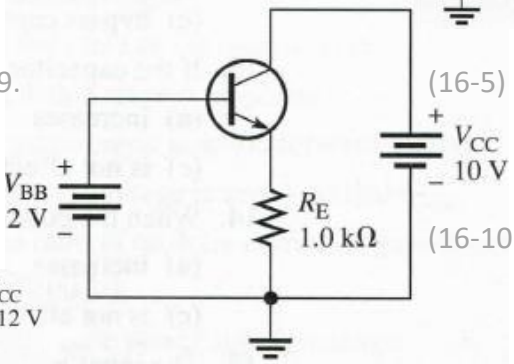
4. Refer to Figure and draw the waveforms V_A and V_B with relation to the input waveform. (15-30)

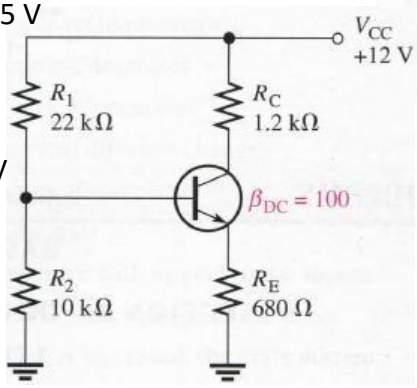




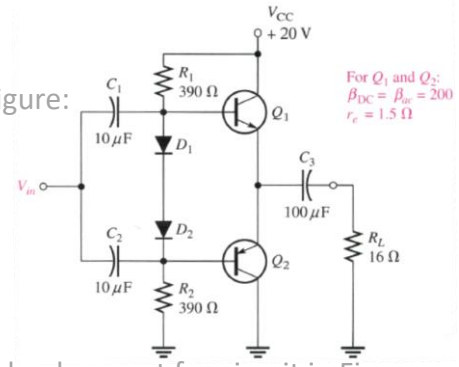
5. Find I_B, I_E, and I_C in Figure given that $\alpha_{DC} = 0.98$ and $\beta_{DC} = 49$. (16-5)
   $I_E = (2 - 0.7) / 1 = 1.3$ mA
   $I_C = 1.3 \times 0.98 = 1.274$ mA
   $I_B = 1.274 / 49 = 0.026$ mA = 26 μA

6. For the circuit in Figure, find V_B, V_E, I_E, I_C, and V_C. (16-10)
   $V_B \approx 12 \times (10 / (10 + 22)) = 3.75$ V
   $V_E \approx 3.75 - 0.7 = 3.05$ V
   $I_E \approx 3.05 / 0.68 \approx 4.485$ mA
   $I_C \approx 4.485$ mA
   $V_C \approx 12 - 4.485 \times 1.2 = 6.618$ V



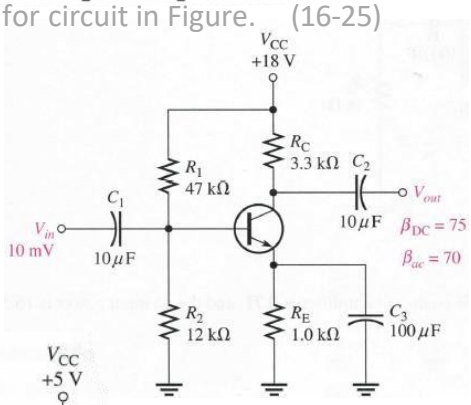


7. Determine the following dc values for the amplifier in Figure: (16-17)



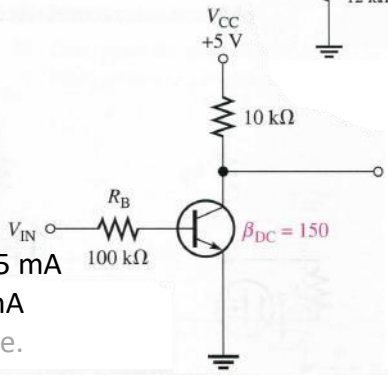
(a) $V_B \approx 18 \times (12 / (12 + 47)) \approx 3.661$ V
(b) $V_E \approx 3.661 - 0.7 = 2.961$ V
(c) $I_E \approx 2.961 / 1 = 2.961$ mA
(d) $I_C \approx 2.961$ mA
(e) $V_C \approx 18 - 2.961 \times 3.3 = 8.2287$ V
(f) $V_{CE} \approx 8.2287 - 2.961 = 5.2677$ V

8. Determine the maximum peak output voltage and peak load current for circuit in Figure. (16-25)



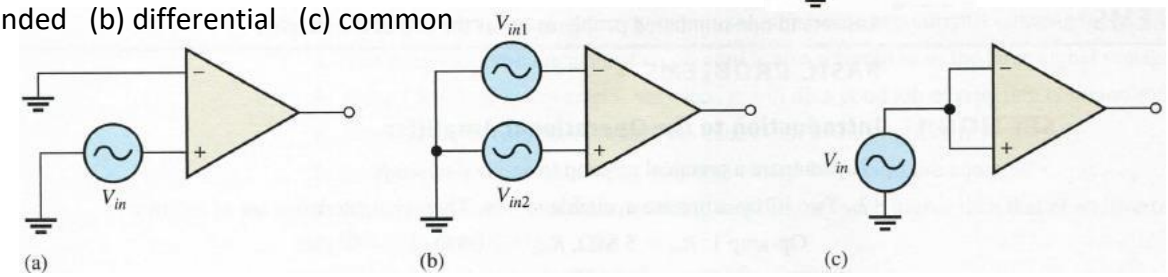
maximum peak output ≈ 20 / 2 = 10 V
peak load current ≈ 10 / 16 = 0.625 A

9. Determine $I_{C(sat)}$ for the transistor in Figure.
What is the value of I_B necessary to produce saturation?
What minimum value of V_{IN} is necessary for saturation? (16-27)

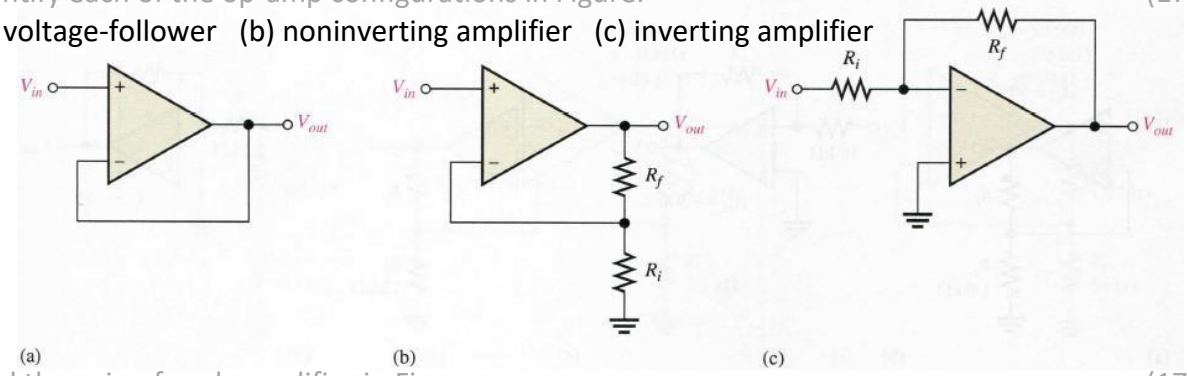


When $V_{IN} = V_{CC} = 5$ V :
$I_{C(sat)} = 5 / (10 \times 100 / (10 + 100)) \times (100 / (100 + 10)) = 0.5$ mA
$I_B = 5 / (10 \times 100 / (10 + 100)) \times (10 / (100 + 10)) = 0.05$ mA

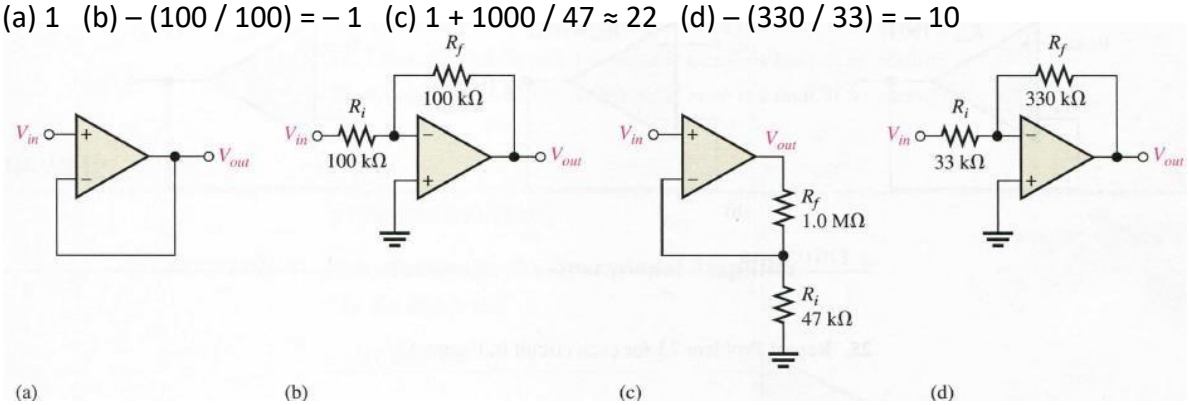
10. Identify the type of input mode for each op-amp in Figure. (17-7)
(a) single-ended (b) differential (c) common



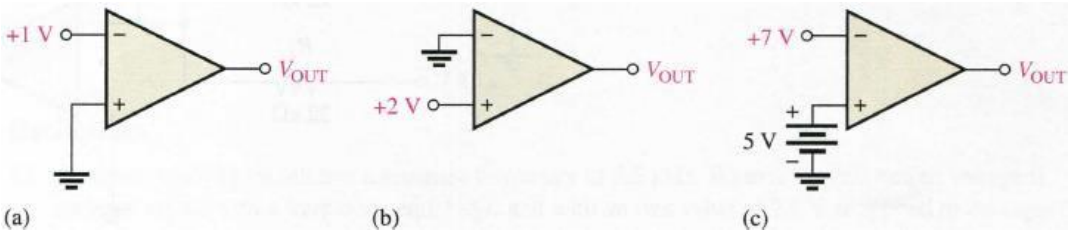
11. Identify each of the op-amp configurations in Figure. (17-16)
(a) voltage-follower (b) noninverting amplifier (c) inverting amplifier



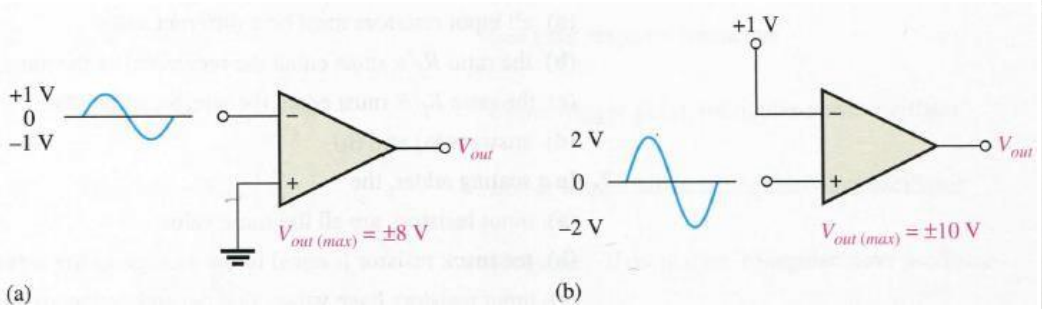
12. Find the gain of each amplifier in Figure. (17-20)
(a) 1 (b) – (100 / 100) = – 1 (c) 1 + 1000 / 47 ≈ 22 (d) – (330 / 33) = – 10

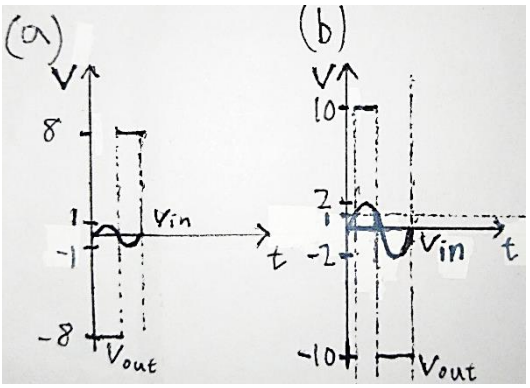


13. Determine the output level (maximum positive or maximum negative) for each comparator in Figure.
(a) maximum negative (b) maximum positive (c) maximum negative (18-1)

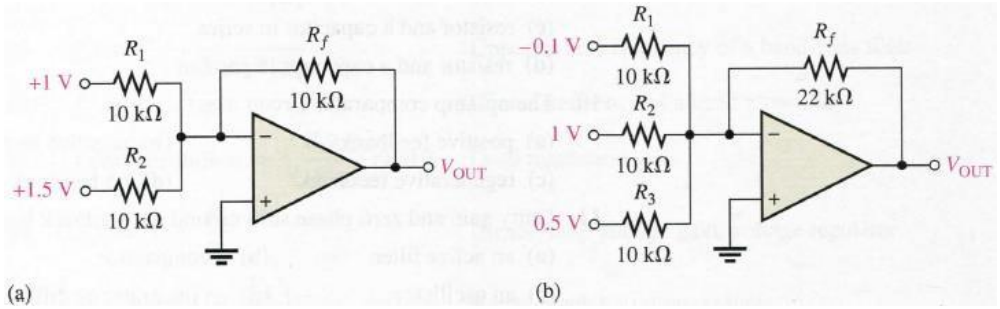


14. Draw the output voltage waveform for each circuit in Figure with respect to the input. (18-3)
Show voltage levels.

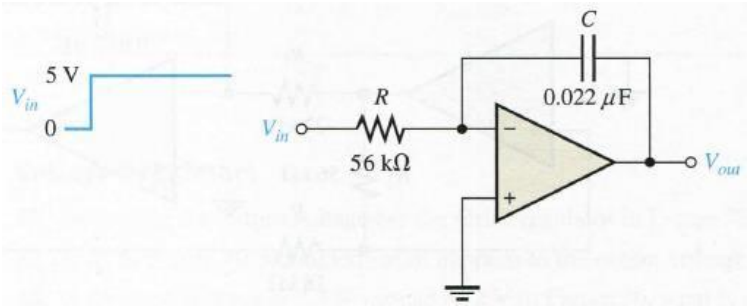




15. Determine the output voltage for each circuit in Figure.
(a) 1 + 1.5 = 2.5 V (b) (– 0.1 + 1 + 0.5) x 22 / 10 = 3.08 V (18-4)



16. Determine the rate of change of the output voltage
in response to the step input to the ideal integrator in Figure. (18-9)
– (5 / 56000 / 0.000000022) ≈ – 4058 V/s



17. A triangular waveform is applied to the input of the ideal differentiator in Figure as shown.
Determine what the output should be, and draw its waveform in relation to the input. (18-10)
– (5 / (0.00001 / 2) x 10000 x 0.000000001) = – 10 V