

PHY2250 - Electronics & Circuit Theory, Practice Test 3

Name: _____

Turn off (OFF) all cell phones


Multiple Choice: In the following problems, choose the "best" answer.

1. (4 points) When a transistor is in saturation,
 - a) $V_{CE} = V_{CC}$
 - b) $I_C = 0A$
 - c) $V_{CE} = V_{CC} / 2$
 - d) $V_{CE} = 0V$

 2. (4 points) For the common-collector amplifier, the input and output voltages are
 - a) in phase.
 - b) 90° out of phase.
 - c) 180° out of phase.
 - d) 270° out of phase.

 3. (4 points) In a FET, what are the labels of the three connections?
 - a) emitter, collector, base
 - b) drain, source, base
 - c) source, gate, drain
 - d) gain, emitter, source

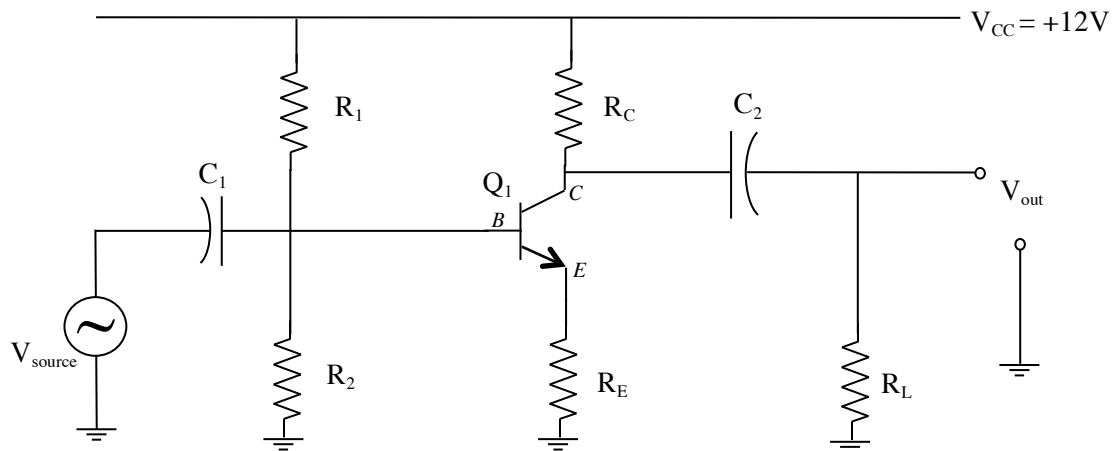
 4. (4 points) How many leads on an op-amp are typically used?
 - a) 5
 - b) 6
 - c) 8
 - d) 9

 5. (4 points) How many pins are there on a 741 IC op amp package?
 - a) 5
 - b) 6
 - c) 7
 - d) 8
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7. (4 points) In a given transistor circuit, the DC currents are $I_E = 25mA$, $I_B = 1mA$. $I_C = ?$
 - a) .4 mA
 - b) 24 mA
 - c) 5 mA
 - d) 2 mA

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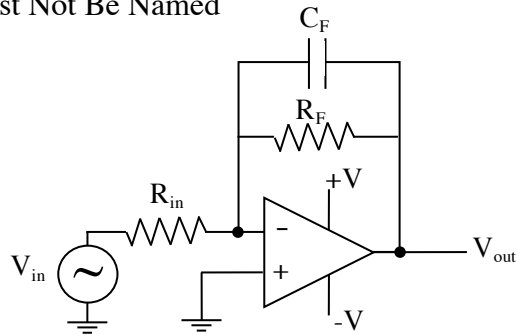
Questions 8 to 17 refer to the following circuit used (unknowingly) by the Jonas Brothers. Use the values $R_1 = 5.5\text{k}\Omega$, $R_2 = 4.5\text{k}\Omega$, $R_C = 1\text{k}\Omega$, $R_E = 750\Omega$, and $R_L = \infty$.



Questions 8 through 14 refer to DC, "quiescent points" of the transistor's operation:

8. (4 points) $V_B = ?$
 - a) 6.6 V
 - b) 4.7 V
 - c) 5.4 V
 - d) 3.3 V
9. (4 points) $V_E = ?$
 - a) 6.6 V
 - b) 5.4 V
 - c) 4.7 V
 - d) 3.3 V
10. (4 points) $I_E = ?$
 - a) 4.5 mA
 - b) 0.2 mA
 - c) 6.3 mA
 - d) 1.2 mA
11. (4 points) If $I_B = 0.1 \text{ mA}$, $I_C = ?$
 - a) 0.32 mA
 - b) 3.2 mA
 - c) 6.2 mA
 - d) 12 mA
12. (4 points) $\beta_{DC} = ?$
 - a) 73
 - b) 225
 - c) 108
 - d) 62
13. (4 points) $V_C = ?$
 - a) 4.3 V
 - b) 6.2 V
 - c) 4.7 V
 - d) 5.8 V
14. (4 points) $V_{CE} = ?$
 - a) 1.2 V
 - b) 3.8 V
 - c) 1.5 V
 - d) 12 V
15. (4 points) If Q_1 were in saturation (e.g. when V_B swings high), what would V_C be?
 - a) 0 V
 - b) 4.7 V
 - c) 5.14 V
 - d) 12 V
16. (4 points) If Q_1 were in cutoff (e.g. when V_B swings low), what would V_C be?
 - a) 0 V
 - b) 4.7 V
 - c) 5.14 V
 - d) 12 V
17. (4 points) The above transistor is connected in a common-_____ configuration.
 - a) collector
 - b) base
 - c) emitter
 - d) mode

18. (4 Points) The best name for the following op-amp circuit (below) is
- a) Closed-loop non-inverting amplifier
 - b) Low-pass filter
 - c) Compressor
 - d) Comparator
 - e) The Circuit That Must Not Be Named

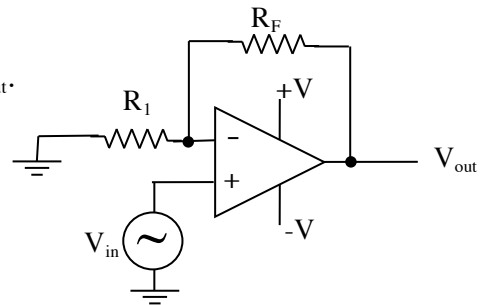


Short Answer: In the following problems, remember to show your work in completing any calculations.

19. (6 points) Draw the DC Load Line for the circuit referred to in problems 8 to 17.

20. (10 points) Regarding the following op-amp circuit...

- a) Find V_- , the voltage at the - input, in terms of R_1 , R_F and V_{out} .
- b) If the feedback loop functions so as to force $V_- = V_+$, use your answer to (b) to compute the gain of the amplifier (in terms of R_1 and R_F). Show all work.



21. (12 points) Design a voltage-divider-biased amplifier, *i.e. find values for resistors R_1 , R_C and R_E* given the following specifications: $V_{CC} = 12\text{ V}$, $V_C = 7\text{ V}$, $V_{CEQ} = 5.5\text{ V}$, $I_{CQ} = 20\text{ mA}$, $\beta_{DC} = 200$, $R_2 = 3\text{ k}\Omega$. Show all work, and put boxes around your final resistor values.

Extra Credit:

22. (3 points) Which is the more popular transistor biasing method *and why* : base bias or voltage divider bias?

23. (2 points) How many valence electrons does Aluminum have?