

EE329 - Introduction to Electronics

Final exam

Name _____

There are two circuits to design. You have available the following components:

Transistors: both NPN and PNP

"small" : $\beta > 100$, $V_A = 200$, $V_{max} = 30$, $P_{max} = .25$ watt, $I_{max} = 100$ ma, Cost = \$0.15.

"medium": $\beta > 60$, $V_A = 100$, $V_{max} = 100$, $P_{max} = 5$ watt, $I_{max} = 1$ Amp, Cost = \$0.75.

"large": $\beta > 30$, $V_A = 80$, $V_{max} = 100$, $P_{max} = 50$ watt, $I_{max} = 10$ Amp, Cost = \$2.50.

Zener diodes: .5 watt, 5% tolerance, standard values, Cost = \$0.50.

Power diodes: 500 PIV, 5 Amps, Cost = \$0.50.

Resistors: .25 watt and 2 watt, 5% tolerance, standard values. Cost = \$0.02 for .25 watt, \$0.10 for 2 watt.

Capacitors, 100 volt, 20% tolerance, standard values.

The 5% standard values are:

10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47, 51, 56, 62, 68, 75, 82, 91.

The 20% standard values are:

10, 15, 22, 33, 47, 68.

You must use standard values.

1. Design an instrumentation amplifier to the following specs:

Voltage gain = 10, with 50 ohm load. Inverting.

$Z_{in} = 1$ meg, $\pm 10\%$

$Z_{out} = 50$ ohms, $\pm 10\%$

Power supply = ± 15 volts (30 total)

Voltage swing = ± 5 into 50 ohms.

Frequency response, -3 dB at 16 Hz.

2. Design a regulated power supply for the above amplifier.

$V_{out} = +$ and $- 15$ volts, 20% tolerance, at with load 0 to 100 ma.

You must use a power transformer that supplies 48 volts AC with a center tap. (24 each half).

Use an emitter follower with zener diode type regulator. Be sure to check the maximum ratings of all devices.