AE-252 Mid-term exam

NAME:_____ DATE:_____

The questions in this exam relate specifically to the **power supply schematic** for the *Vari-fi* JFET preamp kit, which can be downloaded at:

http://www.tangible-technology.com/ipr/AE230/html/wk_4/vari-fi/jfet_pre/VF_psu.html

PLEASE do the work in pencil, show all work (starting with formulae) and be sure to specify quantity (volts, amps, watts, dB, etc.).

1. The *Vari-fi* JFET mic preamplifier consists of two gain stages each on its own printed circuit board (PCB). Each PCB requires 24-volts dc @ 40mA from the power supply unit (PSU). The equivalent resistance of each preamp board is _____-ohms and each dissipates _____ watts.

_____

2. The low-voltage secondary of the power transformer (xfrmr) connects to the PSU via connector _____. The secondary has two ____-volt windings that have a common connection at J-1 pins ____ and ____. This common connection becomes _____ and travels, from left to right, to pin-____ of J-2.
3. Power for the preamps starts at the transformer secondary and is rectified by diodes _____ and _____, a _____-wave rectifier, after which the raw DC is filtered by _____.
4. This is followed by a voltage divider that consists of _____ and _____ .
5. The voltage drop across R-1 is_____

_____

6. The current through R-1 is _____

_____

7. The power dissipated by R-1 is _____

_____

8. The purpose of Z-1 is _____ .

9. The base-emitter voltage drop for Q-1 should be _____.

10. The measured base-emitter voltage is _____.

11. The preamp PCBs require approximately 24-volts and the PSU delivers within _____ per cent.

_____

12. As mentioned in question-1, when testing the PSU, two resistors simulated the load of each preamp module. These resistors were connected between J2 pin-3 and _____ (J-____ , pin-_____). In the schematic, the power supply output voltage is slightly higher and the closest standard resistor values (that were near at hand) were 620-Ω @ 1 watt each. What is the current through each resistor and the power dissipation?

_____

_____

13. For all device ratings - fuses (current), Resistors (wattage), Capacitors (voltage) - here is the formula to correlate the safe operating range so that it is within 75% of the devices rated value.

$\frac{75}{100} = \frac{x\ (\text{the current, voltage or wattage at the device})}{y\ (\text{the device's rating})}$	For example, a 20amp circuit breaker should see no more than 15 amps of continuous current. By using the formula and cross-multiplying (100x = 75*y = 100x = 75*20) you can see that (x = .75 * 20A = 15A) or x = 1500/100 = 15A. Conversely, if you know the current, voltage or wattage at the device, you can then calculate the safe rating ***above*** which the device should be rated.

Based on this formula, **calculate the safe power rating for the resistors in question-12** to the nearest rounded-up wattage (typical wattage values are 1/4, 1/2, 1, 2, 3, 5, 10).

_____

_____

14. The phantom power supply is fed from one leg of the xfrmr secondary through _____ and _____ before reaching the rectifier, which consists of _____ and _____. This circuit is essentially two _____-wave rectifiers in a _____ _____ configuration, named because it produces twice as much DC voltage than the RMS AC voltage feeding it.

15. Once rectified, the raw DC is filtered by _____ and clamped at approximately _____ volts by the two series _____, designated _____ and _____.

16. The phantom power output appears at pin-_____ of J-_____

_____

_____

17. The phantom power supply also fed a 3k4 resistive load to simulate the worst case scenario (shorting the the two ____-Ω phantom resistors at pin-2 and pin-3 of the XLR to ground).

18. As stated in note-3 on the schematic, the no-load to worst case full-load output of the power supply ranges from 51.3 volts to 45.6 volts. This change in load is reflected back at R4. What is the AC current through, and the power dissipated by R4 from no-load to full-load?

_____

_____

19. Is the wattage dissipated by R4 within 75% of the resistor's rating on the schematic? (show work)

_____

20. The power indicating LED is designated _____. Is it before or after the voltage regulator? _____

21. The resistor, R- _____, feeding the LED has to "throw away" _____ volts ($\mathbf{V}_{R3}$) in order to not blow up the LED. What is the current through R-4 and DL-1?

_____

_____

22. Based on all the information available to you, what is the voltage at DL-1?

_____

I=E/R E=IR R=E/I P=VI P=**I**squared**R** P=**E**squared/**R**