Laboratory Experiment

Experiment

1

THERMAL STABILITY

Lab. Student: _____ **Rating:** _____
Lab Instructor's Initial: _____ **Date Performed:** _____

Experiment's objectives:

- To demonstrate the relative thermal stability of a basic amplifier circuit.

Materials Required:

1 unit Analog Multimeter	1 pc 10 K ohm, ½ Watt resistor
1 unit Soldering Iron with Stand	1 pc 22 K ohm , ½ Watt resistor
1 pc MPSA20 NPN Transistor	1 pc 470 K ohm, ½ Watt resistor
1 pc 2.2 K ohm, ½ Watt resistor	1 pc 1.5 M ohm potentiometer
1 pc 4.7 K ohm, ½ Watt resistor	

Note: Please check the box after the material has been identified.

Procedure:

1. Construct the circuit in figure 4-11
2. Install the NPN transistor and observe the proper pin configuration. The 1.5 M ohms potentiometer (R2) is used to adjust the transistor's base current and the 470-K ohms (R1) is in series with R2 to limit the maximum base current value. The 4.7 K-ohm resistors R3 as the collector load resistor.
3. Adjust the power supply DC voltage to approximately 10 Volts to supply the circuit
4. Measure the transistor's collector to emitter voltage, then adjust the 1.5 M ohms potentiometer until the voltage indicate a VCE of 5 V to biased the circuit properly.
5. Apply heat to the transistor and observe the change in he output. However, before you actually perform this step, be sure to read it through so you will know exactly what to do. Use a 20 to 40 watt soldering iron as your source of heat, but be sure it has reached its maximum operating temperature and the tip of the iron is clean. Connect your voltmeter across the transistor so you can observe voltage VCE, while you apply heat to the circuit. Then, touch the tip of the iron to the flat side of the transistor and hold it there for exactly 20 seconds (measure this time with a watch or clock). Note the value of VCE at the end of 20 second-period at the instance you remove the soldering iron. Record this VCE value below.

VCE after 20 seconds = _____ volts

If your first measurement is unsuccessful, wait at least 5 minutes before you try again. This will give your circuit a chance to cool completely.

The VCE value at the end of the 20 second period should be lower. Subtract this lover VCE value from the original VCE value for 5 volts. The difference between these two values represents the total change in VCE that takes a place during the 20 second period. Record this total change below.

Change in VCE = _____ volts

6. Install a 2.2 K ohm resistor in series with the transistor's emitter lead so that your circuit appears as shown in figure 4-12. Your experimental circuit now contains a 2.2 K ohm emitter resistor which will provide emitter feedback.
7. You measure the voltage collector referenced to ground and write your readings below. Then, measure voltage emitter reference to ground and record your reading. Calculate VCE.

VC = _____volts
VE = _____volts
VCE = _____volts

Repeat steps 4, 5 and 7

VC after 20 seconds _____volts
VE after 20 seconds _____volts
VCE after 20 seconds VC-VE =_____volts
Change in VCE = _____volts

8. Rewire the circuit so that it appears as shown in figure 4-13. Notice that the 470 K ohm resistor must be replaced with a 10 K ohm resistor and a 22 K ohm resistor must be between the transistor's base and ground. Now the circuit is emitter feedback in conjunction with the voltage divider bias.
9. Repeat steps 4, 5 and 7 as you did before. Record your new VCE measurements below.

VC = _____volts
VE = _____volts
VCE after 20 seconds = _____ volts
Change in VCE = _____volts

10. Rewire the circuit so that it appears as shown in figure 4-14. R1 and R2 must be now connected between the transistor's collector and base. This will provide collector feedback in addition to the emitter feedback and voltage – divider bias.
11. Check the voltage supply to ensure that it is still equal to 10 volts. Repeat steps 4, 5 and 7 as you did before. Record your measurements below.

VC after 20 seconds _____volts
VE after 20 seconds _____volts
VCE after 20 seconds VC-VE =_____volts
Change in VCE = _____volts

CONCLUSION:

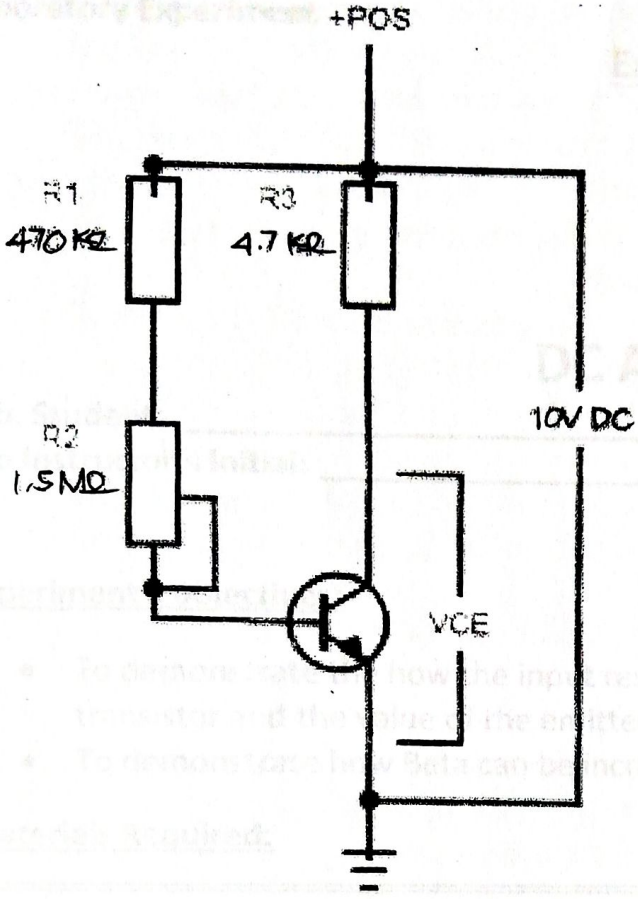

FIGURE 4-11

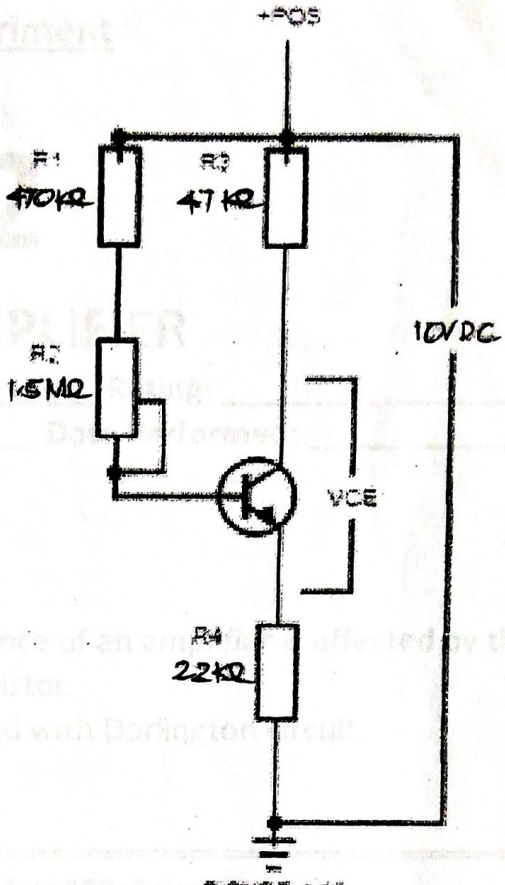

FIGURE 4-12

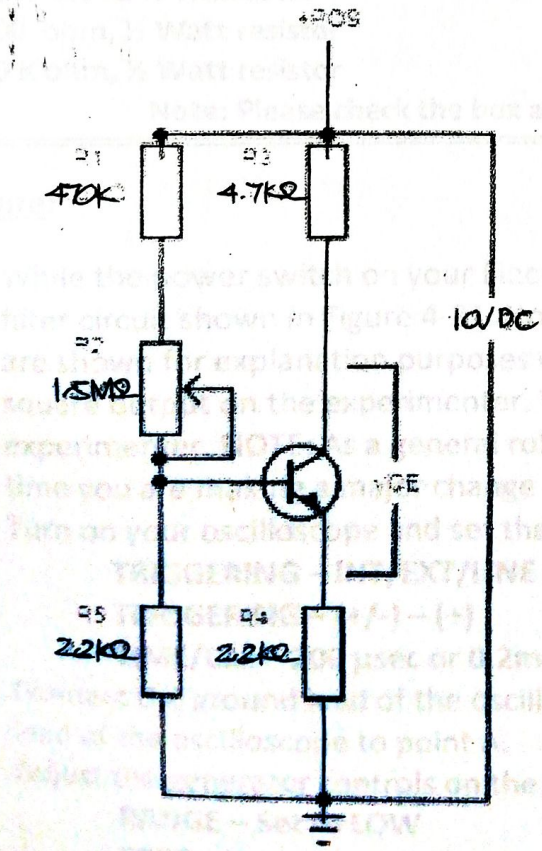

FIGURE 4-13

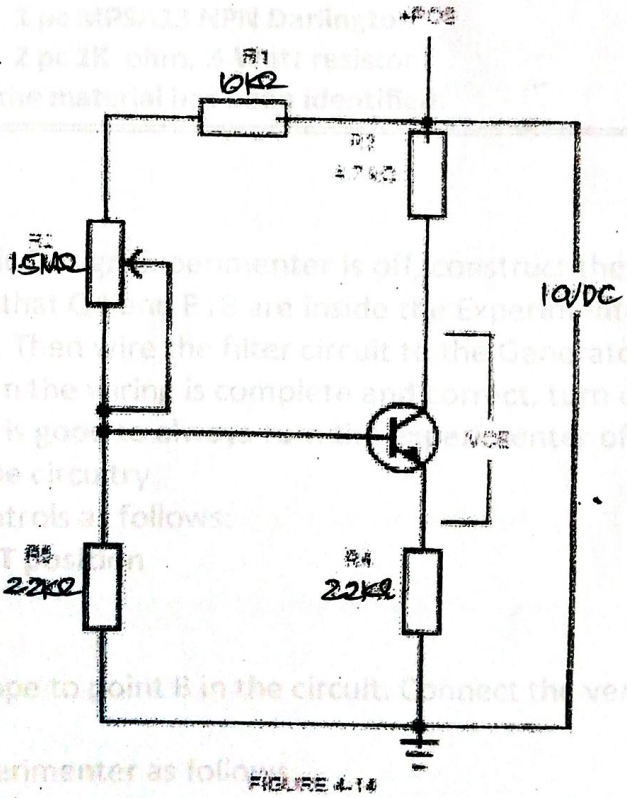

FIGURE 4-14