INSTRUCTIONS: 1. CHECK TO MAKE SURE ALL PAGES ARE STAPLED TO TEST. NO CREDIT ALLOWANCE FOR MISSING PAGES. (5 PAGES)
2. SHOW ALL SOLUTION STEPS IN A NEAT FORMAT. NO CREDIT FOR ANSWERS ONLY OR SLOPPY WORK.

1. FOR THE FOLLOWING COMPARATOR CIRCUIT FIND (a) VREF WHEN WIPER OF R2 IS ALL THE WAY DOWN, (b) VREF WHEN WIPER OF R2 IS ALL THE WAY UP, (c) VREF WHEN THE WIPER OF R2 IS AT THE 50% POSITION

BONUS: FOR PROBLEM #1 FIND R1 AND R3 IF VUT= 9 VOLTS AND VLT= -5 VOLTS
2. FOR THE FOLLOWING FIND: (a) IR, (b) IZ, (c) VREF, (d) V2, V1, I1, I2 AND IT IF VIN=8.9 VOLTS (e) V2, V1, I1, I2 AND IT IF VIN=9.1 VOLTS

3. SKETCH THE WAVEFORMS OF VIN, VOUT, V1 AND V2 IN PROPER TIME RELATIONSHIP SHOW ZERO VOLT REFERENCE AND +VPEAKS, −VPEAKS

4. FIND I1, I2, AND I3 (a) VIN=1 VOLT AND (b) VIN=10 VOLTS

OP-2
1. Draw a voltage follower (label all pins) for the following CKT to couple VR2 to RL. Use +/- 8 VDC power supply connections.

FIND: IR1, IR2, IL, VR2, VRL

2. Draw a non-inverting amplifier using a operational amplifier (label pins)
RI= 1K, RL= 10K, VIN= 1V, and VOUT= 10V

FIND: RF, IRI, IRF, IL, IOUT

3. Draw a inverting amplifier using a operational amplifier (label pins)
RF= 5K, RL= 20K, VIN= 2V, and VOUT= -5V

FIND: RI, IRI, IRF, IL, IOUT

4. Define or illustrate the following opamp terms:
(a) AOL, (b) ACL, (c) VDIFF, (d) R OPAMP

**Bonus: (e) "Virtual Ground" (f) Dual Voltage Power Supply (g) Impedance Buffer (h) Gain-Bandwidth Product