**American University of Science & Technology**

 **Department of Computer and Communications Engineering**

**CCE 301L: Electronics Laboratory**

 **Fall Term 2011-2012**

 **Final Exam**

April 21, 2011

 **Student Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ID Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**CLOSED BOOK (90 Minutes)**

**IT IS IMPORTANT THAT YOU READ AND UNDERSTAND THE FOLLOWING:**

**Questions are not allowed** during the examination. If you believe that there is ambiguity in a specific question, simply write your own assumptions and proceed with the answer.

The **CHEATING** penalty will result in an **F** in the course.

**Mobile Phones** are strictly prohibited in the examination hall.

**Programmable Calculators** are not allowed in this exam.

**Borrowing** of any material is not permissible.

Write your **Name** and **ID Number** in the indicated space of the question booklet.

You may use the back of any page of for **scratch** or for your **answers**.

**Do not detach** any sheet from the question booklet.

This exam consists of **2 pages**. **Make sure that you have the correct number of pages**.

**THE WHOLE EXAM SHOULD BE MADE ON THIS QUESTION BOOKLET**

**ANY OTHER SUBMISSION IS NOT GOING TO BE GRADED**

**YOU NEED TO SHOW ALL OF YOUR WORK TO GET COMPLETE CREDIT.**

**Good Luck!**

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| --- | --- |
| **Problem**  | **Points** |
|  **1** |  **: 05** |
|  **2** |  **: 20** |
|  **3** |  **: 15** |
|  **4** |  **: 10** |
|  5 |  **: 15** |
|  **6** |  **: 25** |
|  **7** |  **: 10** |

 **SCORE /100**

**Question #1 (5 points)**

**Find the output voltage of the following amplifier:**

1. **An op amp without negative or positive feedback (comparator) has at its positive input +3 V and at its negative or inverting input +4 V. Determine the output voltage Vout of this comparator. (2.5 points)**
2. **Same question as a. but +3 V is feeding the inverting input and +4 its positive or non inverting input. (2.5 points)**

**Question #2 (20 points)**

**Design a voltage stabilizer with 220 V** $\pm $ **20% as voltage input and 220 V**$\pm $ **5% as voltage output.**

**You have to show your calculation for all circuit(s) in your answer. Specially the control circuit must be drawn for three transformer-tapes in details.**

**Question #3 (15 points)**

**Design two-stage amplifier circuit for low frequency indicating the value of all components.**

**(50<Av<100; no load)**

**Question #4 (10 points)**

**Draw a common-emitter amplifier followed by a Darlington circuit. Indicate the value of Av and Ai.**

**Explain the purpose of this combination.**

**Question # 5 (15 points)**

**Design an electronic circuit that automatically-dims the light of an AC lamp as a function of the external daylight. You can use the LDR (light dependent resistor) as a light sensor. Draw and explain the designed circuit.**

**Remark: The resistance of an LDR is very high, sometimes as high as 1 MΩ, but when it is illuminated with light its resistance drops dramatically.**

**Question # 6 (25 points)**

**Design an automatic 220V AC / 12V DC battery charger based on a voltage comparator that compares between the battery voltage and a reference voltage provided by a Zener diode. Draw and explain the complete designed circuit.**

**Question # 7 (10 points)**

**Design a sine wave oscillator for a frequency equal to 5000 Hz. Show your complete calculation.**