

NATIONAL UNIVERSITY OF SCIENCES & TECHNOLOGY

Electronic Circuit Design (EE-313)

Assignment # 2

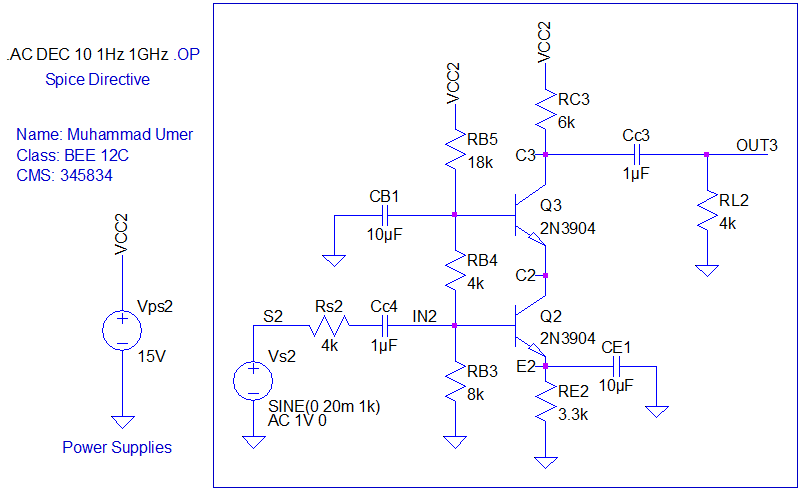
Analysis of BJT Current Mirrors and

Cascaded Amplifiers

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| Class: | BEE-12C |
| Semester: | 5th |
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| CMS ID: | 345834 |

# Assignment Solution

## BJT Cascode



### Gain



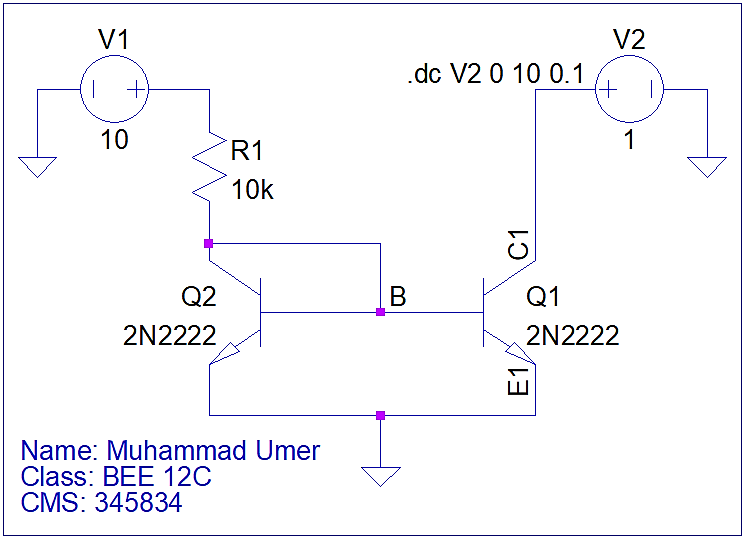
*Gain of Cascoded Amplifier:*

*Calculations:*

### Bode Plot



## BJT Mirror for ROUT Calculations



*As there is no load at the collector of Q1 transistor,*

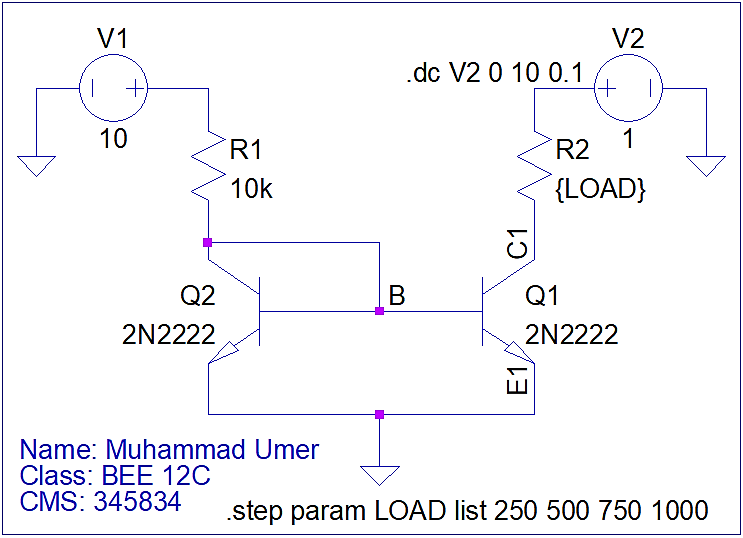
For BJT circuits, can be calculated using the relation:

For the present case, emitter is grounded (0 V); the relation, thus, transforms to:

In LTSpice, one can plot the derivative (change) of a variable with respect to another, by using the notation D(). To plot , we use as the trace in the expression editor.



## BJT Mirror with Changing Load



To verify that current remains constant for various loads, we perform parametric sweep on the load resistor R2. Stepping it up from 250 to 1000 in steps of 250, we can get a plot showcasing the respective currents passing through the load resistor, and, as is expected, current mirror keeps the current constant even under different load conditions.



# Conclusion

In this assignment, we learned two important configurations of BJTs; cascoded common emitter amplifier as well as the current mirror. We observed that we can achieve a relatively stable gain as well as bandwidth with a cascoded configuration (with one stage focused towards gain, and the other towards bandwidth) than a simple BJT amplifier where trade-offs are inevitable. Lastly, we proved the fundamental property of current mirrors, i.e. constant characteristics of load current under various loads, by applying parametric sweep analysis on the current mirror.