North South University

Assignment

Course Code: EEE111

Course Title: Analogue Electronics

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Section: 11

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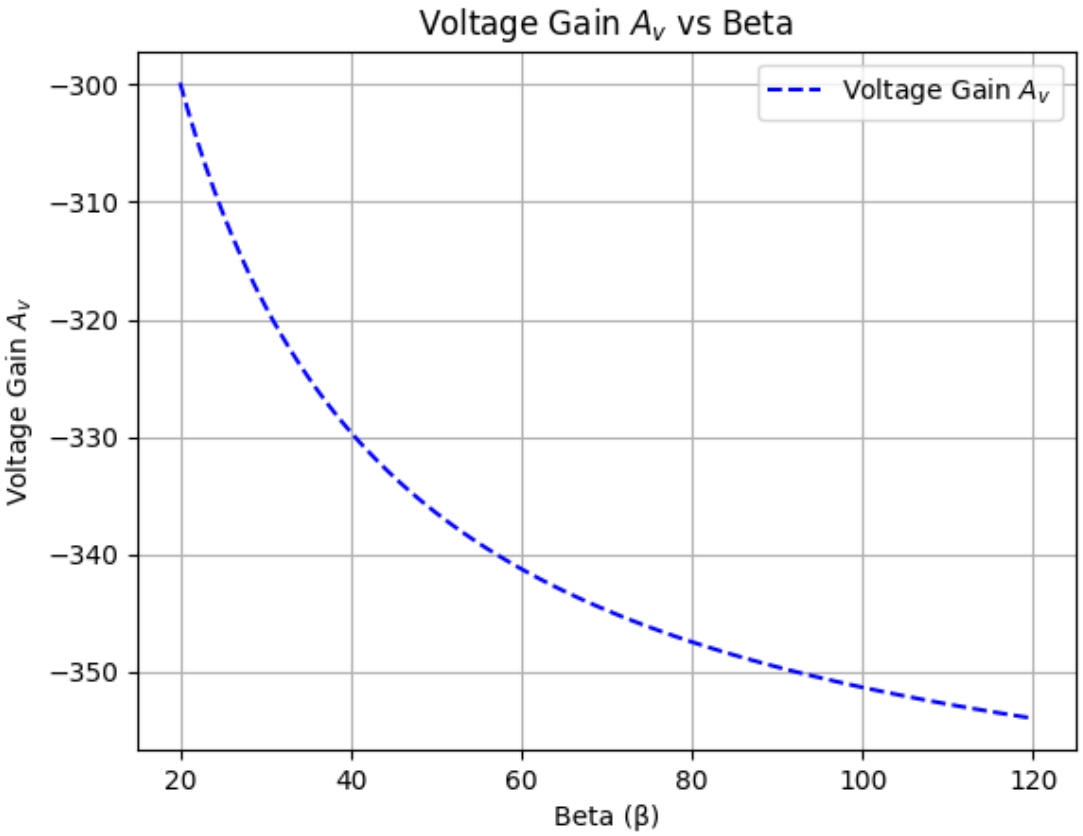
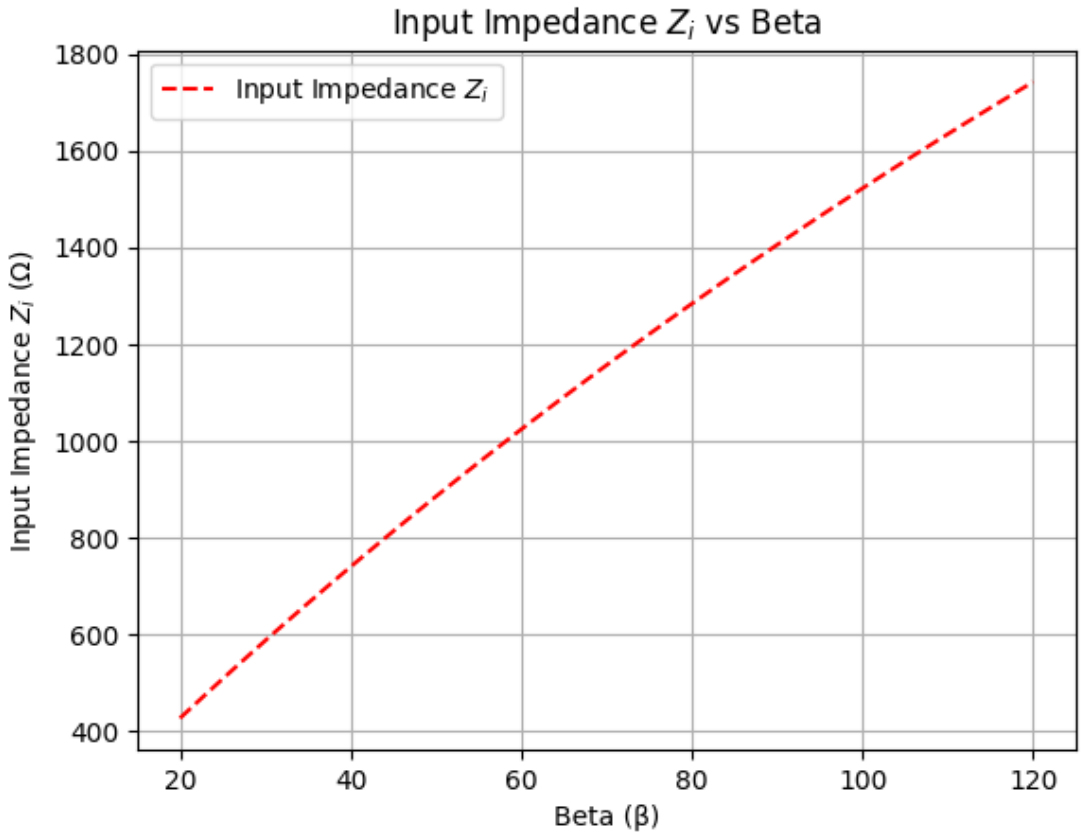
Python code:

```
import matplotlib.pyplot as plt

V_Th = 2.81
V_BE = 0.7
R_Th = 7.15e3
V_T = 26e-3
R_E = 1.5e3
R_C = 6.8e3
beta_values = [i for i in range(20, 121)]

Z_i_values = []
A_v_values = []

for beta in beta_values:
    I_B = (V_Th - V_BE) / (R_Th + (1 + beta) * R_E)
    r_e = V_T / ((1 + beta) * I_B)
    Z_i = (R_Th * beta * r_e) / (R_Th + (beta * r_e))
    A_v = -R_C / r_e

    Z_i_values.append(Z_i)
    A_v_values.append(A_v)

plt.figure()
plt.plot(beta_values, Z_i_values, 'r--', label="Input Impedance $Z_i$")
plt.xlabel("Beta (β)")
plt.ylabel("Input Impedance $Z_i$ (Ω)")
plt.title("Input Impedance $Z_i$ vs Beta")
plt.legend()
plt.grid()

plt.figure()
plt.plot(beta_values, A_v_values, 'b--', label="Voltage Gain $A_v$")
plt.xlabel("Beta (β)")
plt.ylabel("Voltage Gain $A_v$")
plt.title("Voltage Gain $A_v$ vs Beta")
plt.legend()
plt.grid()

plt.show()
```


Voltage Gain A_v vs Beta
Voltage Gain A_v
−300
−310
−320
−330
−340
−350
Voltage Gain A_v
20
40
60
80
100
120
Beta (β)


Input Impedance Z_i vs Beta
Input Impedance Z_i
1800
1600
1400
1200
1000
800
600
400
Input Impedance Z_i (Ω)
20
40
60
80
100
120
Beta (β)