**诚信应考,考试作弊将带来严重后果！**

姓名 学号  学院 专业 座位号

( 密 封 线 内 不 答 题 )

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**华南理工大学期末考试**

**《电路与电子技术》试卷A**

**注意事项：1. 考前请将密封线内各项信息填写清楚；**

**2. 所有答案请直接答在答题纸上；**

**3．考试形式：闭卷；**

**4. 本试卷共5大题，其中第1题必做，从剩余题目中另选3题。满分100分，考试时间120分钟**。

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **题 号** | **一** | **二** | **三** | **四** | **总分** |
| **得 分** |  |  |  |  |  |
| **评卷人** |  |  |  |  |  |

INSTRUCTIONS TO CANDIDATES

The numbers in the right hand margin represent an approximate guide to the marks available for that question (or part of a question). Total marks available are 100.

Using **calculator** and **dictionary** is allowed during the examination.

Answer questions **ONE** and other **THREE** questions

For Bipolar Junction Transistors:

At room temperature, and

For MOSFETS:

and

**Q1. a)** Consider the circuit shown in the following figure, find the values of and .

**10**



**b)** Find the Thévenin equivalent circuit of the following circuit, and calculate the maximal output power of the terminal.

**10**



**c)** The following circuit is operating in steady state with the switch open prior to . Find the expression for when and . Calculate the voltage when .

**10**



**d)** Consider the circuit shown in the following figure. Find the phasors and , and .

**10**



**Q2**. Consider the common-emitter amplifier shown in the following figure.

**Total**

**20**



The BJT transistor has and .

**a**) Draw the bias circuit to determine the Q point and calculate the values of , find the value of .

**8**

**b**) Draw the small signal equivalent circuit and calculate the voltage gain , input impedance , output impedance , and power gain , assuming that the coupling capacitors are short circuits for the ac signal.

**12**

**Q3**. Consider the common-source amplifier shown in the following figure.

**Total**

**20**



The NMOS transistor in the above figure has , , , , and.

**a**) Find the value required for to achieve .

**8**

**b**) Draw the small signal equivalent circuit and compute the voltage gain , input impedance , and power gain , assuming that the coupling capacitors are short circuits for the ac signal.

**12**

**Q4**. Operational Amplifier

**Total**

**20**

**a**) Assume that the op-amp is ideal, find the value of voltage gain and input impedance .

**6**



**b)** Assuming the measured process variable is expressed as , and the desired set point is . Design a PID controller using Op-amp based on the following equation:

**6**

**8**

**Q5**. Logic circuits

**Total**

**20**



a**)** Write the logic formula from the above figure

**5**

**b)** Construct a Karnaugh map of the above logic formula, and find the minimal sum of product expression, and the logic circuit.

**10**

**b)** Draw the logic circuit of the minimal sum of product expression above

**5**