

IMPERIAL COLLEGE LONDON

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING  
EXAMINATIONS 2014

EEE PART II: MEng, BEng and ACGI

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## **ANALOGUE ELECTRONICS 2**

Wednesday, 18 June 2014 2:00pm

Time allowed: 2 hours

There are **THREE** questions on this paper.

**ALL** questions are compulsory.

Question 1 carries 40% of the marks and Questions 2 and 3 carry 30% each.

Any special instructions for invigilators and information for candidates are on page 1.

Basic expressions for voltage gain, input and output resistance for single stage amplifiers are given on the last page.

Examiners responsible

First Marker(s): T.G. Constandinou  
Second Marker(s): C. Toumazou

2. The circuit shown below is a laser diode driver based on a transconductance amplifier with feedback.

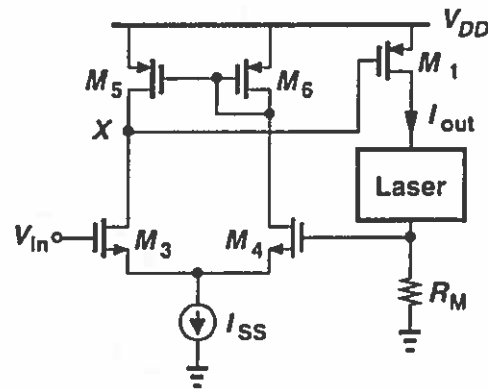
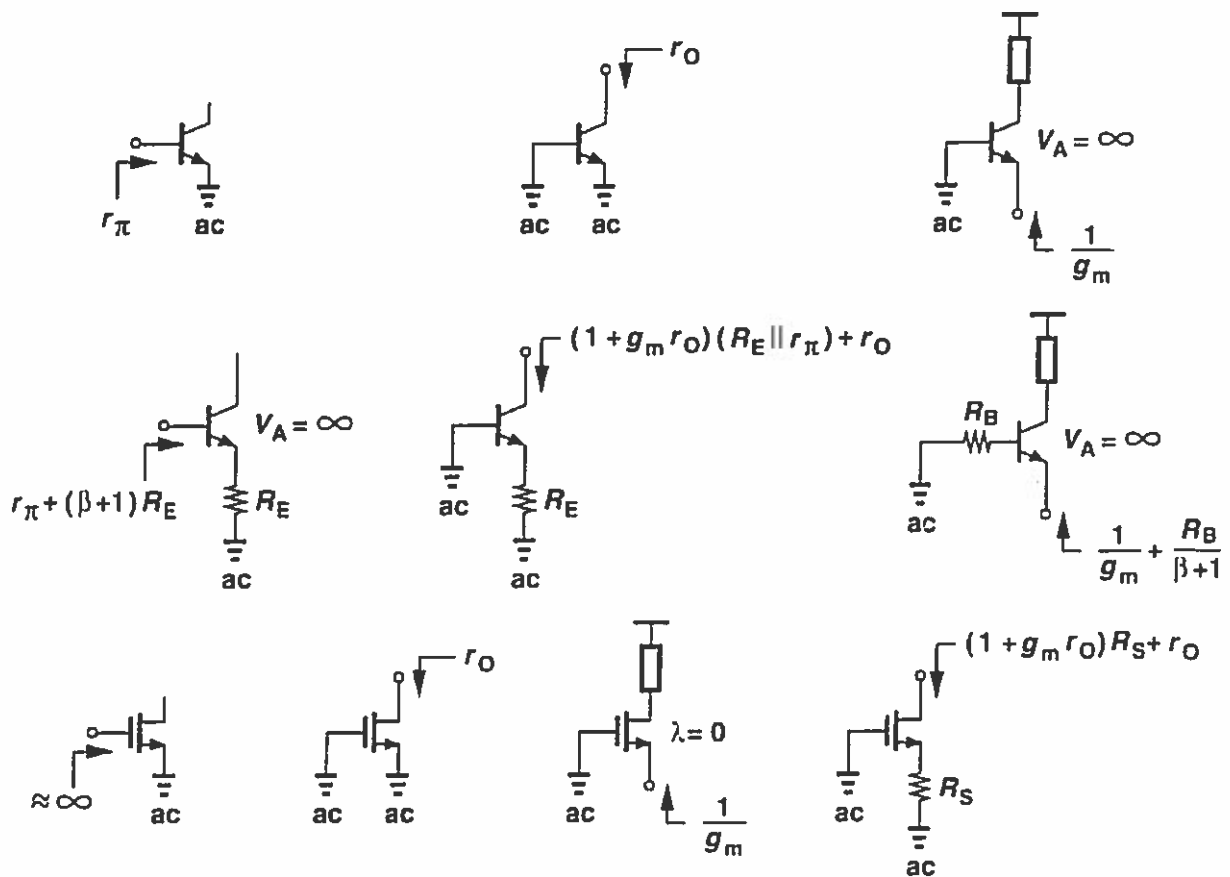


Fig. 2.1

- Determine the following open loop parameters of the transconductance amplifier (hint: you will need to break the loop):
  - Open loop gain, [5]
  - Open loop output resistance. [5]
- Determine expressions for the *feedback factor* and “error” signal. [5]
- Using your answers to (a) and (b), provide an expression for the *closed loop output resistance*. [5]
- Describe how the circuit designer can maximise the *loop gain* in this circuit. [5]
- Explain how the resistance of  $R_M$  should be selected. Given  $V_{DD}=10V$  and  $I_{out}=5mA$ , estimate a value for  $R_M$  justifying your estimate. [5]

## Input and Output Impedances



## Voltage Gain Equations

