



BITS Pilani
Dubai Campus

BITS PILANI DUBAI CAMPUS

DUBAI INTERNATIONAL ACADEMIC CITY, DUBAI UAE

II SEM 2013-2014

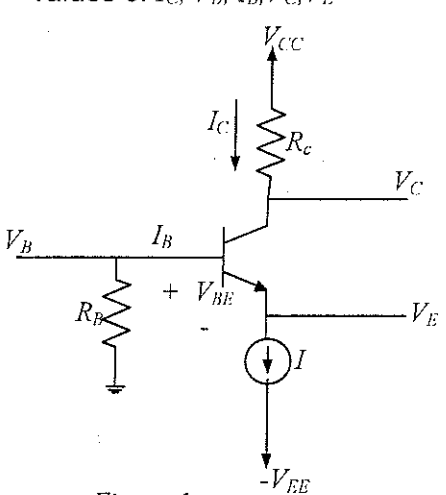
247

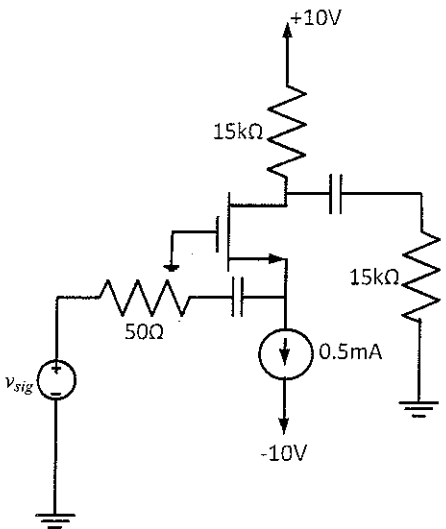
Evaluation Component:	COMPRE EXAM	Date/Time/Duration	01 ST JUNE 2014, 08:30am-11:30am
Course No	: ECE/EEE/INSTR F244 ECE/INSTR C313	Course Name	: MICROELECTRONIC CIRCUITS
Maximum Marks	: 80	Weightage	: 40%

Note: Answer all the questions and any missing data can be assumed suitably,

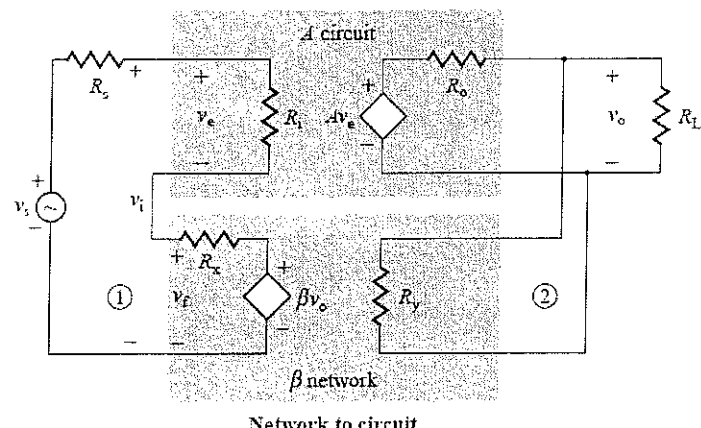
Answer PART A AND PART B in separate answer book

PART A

Q.1	<p>Draw the circuit diagram of a Common emitter amplifier without emitter resistance using current source biasing at the emitter. Using small signal model derive the expression for the following.</p> <ol style="list-style-type: none"> Voltage gain (A_v) Overall Voltage gain (G_v) Input resistance Output resistance Short circuit current gain 	10M
Q.2	<p>a) For the following circuit shown in Fig 1, derive the expression for I_C, V_B, I_B, V_C, V_E</p> <p>b) Given $V_{CC}=V_{EE}=12V$, $I=2mA$, $R_B=200k\Omega$, $R_C=8K\Omega$, $V_{BE}=0.7$ $\beta=200$, find the values of I_C, V_B, I_B, V_C, V_E</p>  <p>Figure 1</p>	10M
Q.3	<p>Draw the small signal equivalent for the Common gate amplifier shown in Figure 2 using T model and find</p> <ol style="list-style-type: none"> Input resistance (R_i) Output resistance (R_o) Voltage gain (A_v) Open circuit voltage gain (A_{vo}) Over all voltage gain (G_v) <p>(Given $g_m=1mA/V$)</p>	8M

	 <p style="text-align: center;">Figure 2</p>	
Q.4	Draw the circuit diagram of a MOSFET current mirror circuit. In that circuit diagram, given $V_{DD}=3V$, and using $I_{REF}=100\mu A$. Find the value of the resistance R, if Q1 and Q2 are matched and have channel length of $1\mu m$, channel widths of $100\mu m$, $V_t=0.7V$ and $k_n'=200\mu A$.	8M
Q.5	Draw the high frequency hybrid- π model for the BJT and briefly explain the corresponding internal capacitances.	4M

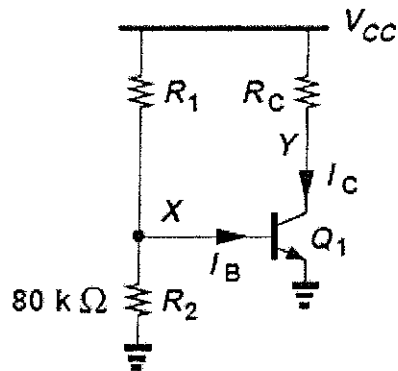
PART B

Q.1	Identify the type of feedback employed in the following circuit, and also find closed loop gain, R_{in} , R_{out} .	8M
		
Q.2	Draw the circuit diagram of Push Pull amplifier? Derive the expression for efficiency? Discuss on its limitations.	10M

Q.3

(a) For the following class A power amplifier circuit find out R_1 and R_C . Assume $V_{CC}=2.5V$, $V_{CEQ}=1.25V$, $V_{BE}=V_x=0.8V$, $R_2=80K$.

6+6M

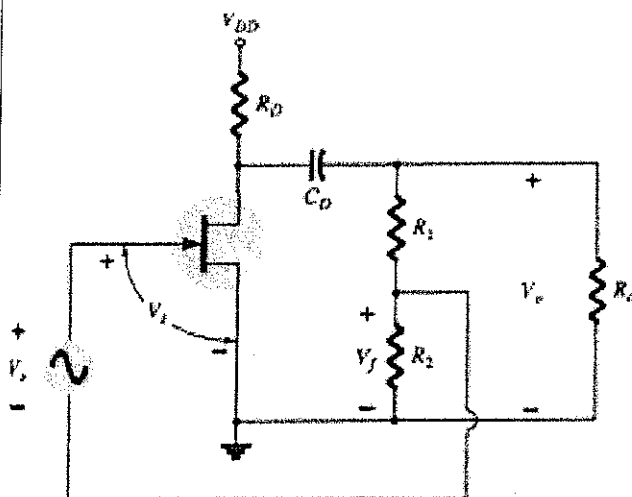


(b) Draw the circuit diagram of MOSFET differential amplifier? And explain its operations.

Q.4

Calculate the gain without and with feedback for the FET amplifier shown in the figure below and following circuit values: $R_1=80k\Omega$, $R_2=20k\Omega$, $R_o=10k\Omega$, $R_D=10k\Omega$, and $g_m=4000\mu A/V$

10M





BITS Pilani
Dubai Campus

BITS PILANI DUBAI CAMPUS

DUBAI INTERNATIONAL ACADEMIC CITY, DUBAI UAE

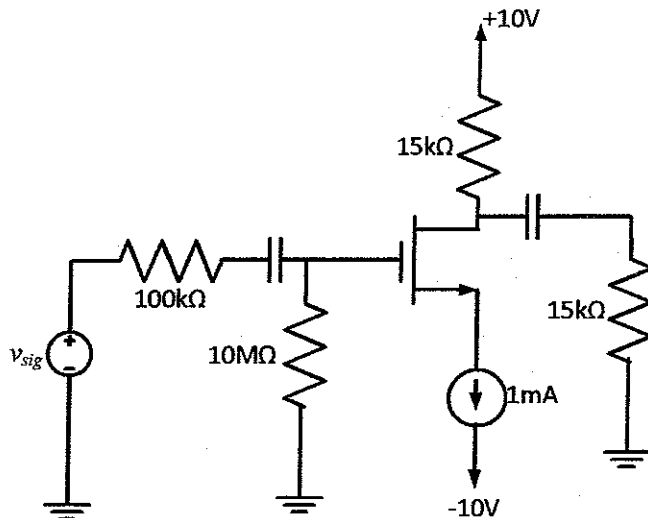
II SEM 2013-2014

Evaluation Component:	TEST 2 (open book)	Date/Time/Duration	14-04-2014/ 8:25am to 9:15am
Course No	: ECE/EEE/INSTR F244 ECE/INSTR C313	Course Name	: MICROELECTRONIC CIRCUITS
Maximum Marks	: 40	Weightage	: 20%

Note: Answer all the questions and any missing data can be assumed suitably, only handwritten notes and proscribed text book is allowed.

Q.1 Given following Common Source MOSFET amplifier with
 $V_t=1.5V$, $V_A=50V$, $k_n'(W/L)=0.5mA/V^2$

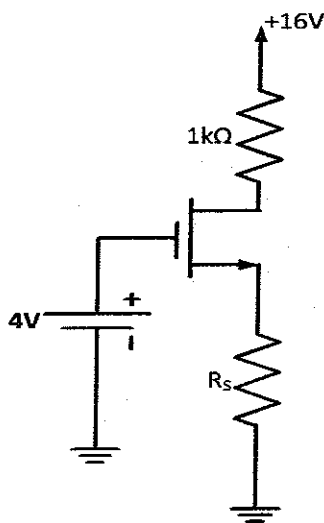
10M



- Draw the small signal equivalent
- Find voltage gain A_v
- Input resistance (R_{in})
- Find overall voltage gain G_v
- output resistance (R_{out})

Q.2 Given following MOSFET circuit

10M



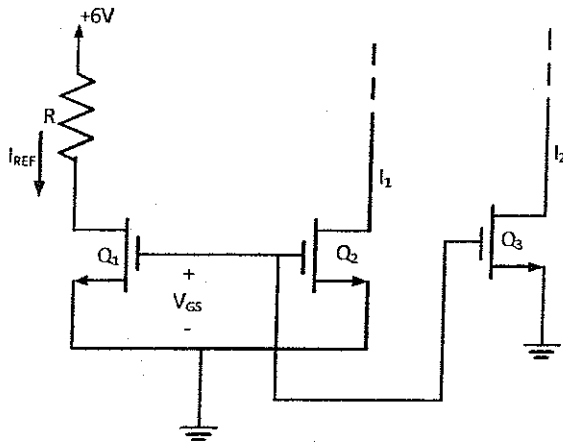
The MOSFET has $k_n=0.25 mA/V^2$, and $V_t=2V$, for $R_s=0\Omega$, Find

- Drain Current I_D
- Voltage between drain and source V_{DS}
- Region of operation of MOSFET

Q.3 Design a current Mirror circuit shown below to get $I_1 = 200\mu A$ and $I_2 = 100\mu A$.

10M

Given $V_t = 1V$, $K_n' = 200\mu A/V^2$ $(W/L)_1 = 20$.

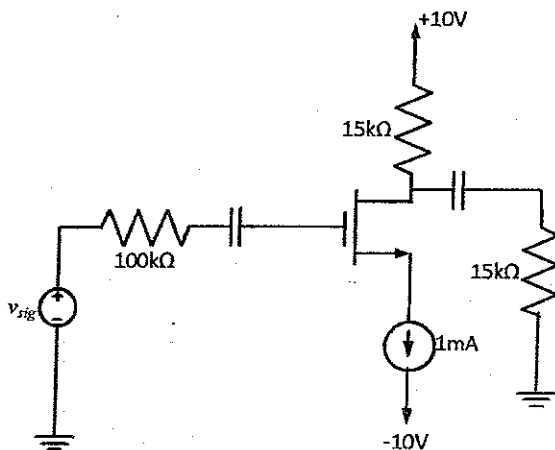


Q.4 Given following Common source amplifier, draw the high frequency small signal equivalent and find the value of unity gain frequency (f_T). Assume that MOSFET is operating saturation region, capacitance C_{db} can neglected to simplify analysis. Given the following parameters for MOSFET.

98M

$t_{ox} = 15nm$, $L = 1.5\mu m$, $W = 15\mu m$, $\epsilon_{ox} = 3.45 \times 10^{-11} F/m$.

Electron mobility (μ_n) = $450cm^2/V-s$, $V_t = 0.5V$





BITS Pilani
Dubai Campus

BITS PILANI DUBAI CAMPUS

DUBAI INTERNATIONAL ACADEMIC CITY, DUBAI UAE

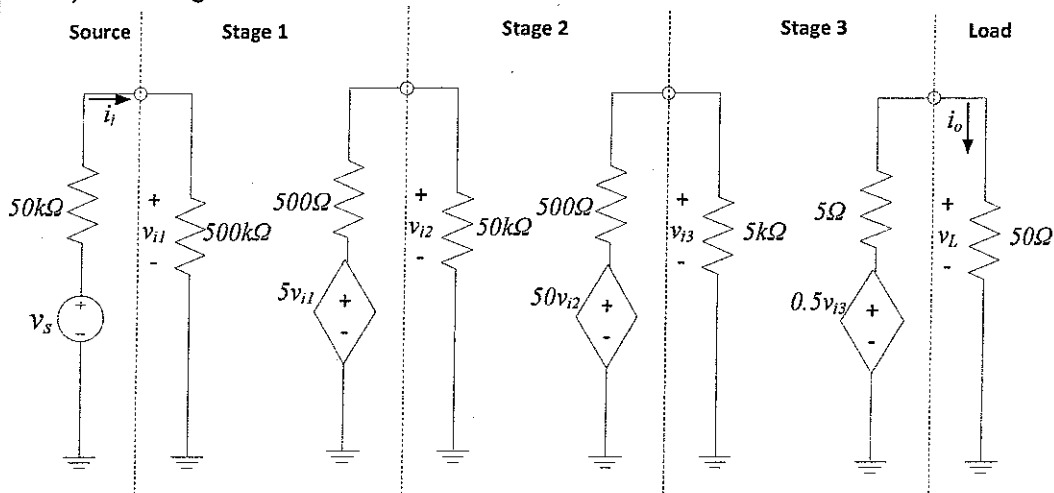
II SEM 2013-2014

Evaluation Component:	TEST 1 (Closed book)	Date/Time/Duration	06-03-2014/ 8:25am to 9:15am
Course No	ECE/EEE/INSTR F244 ECE/INSTR C313	Course Name	MICROELECTRONIC CIRCUITS
Maximum Marks	50	Weightage	25%

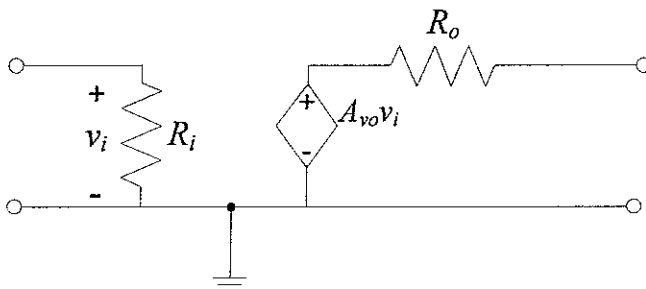
Note: Answer all the questions and any missing data can be assumed suitably

Q.1 For the following cascaded amplifier, determine the following 12M

- voltage gain in the each stage
- Voltage gain
- Overall voltage gain
- Current gain
- Power gain



Q.2 a) Following is the voltage amplifier circuit model, 6M



A source v_s with resistance R_s and load resistance of R_L is connected to the above circuit model. Calculate the overall voltage gain in following case expressed both directly and in decibels.

i) $R_i = 5R_s$ and $R_L = 5R_o$ $A_{vo} = 10V/V$

b) Draw the equivalent circuit model of transresistance amplifier and specify its expression for open circuit transresistance, ideal values of input and output resistance. 6M

