Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
Manipal University

THIRD SEMESTER B.TECH (E & C) DEGREE END SEMESTER EXAMINATION - NOV/DEC 2016

SUBJECT: ANALOG ELECTRONICS CIRCUIT (ECE - 2101)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. Design an emitter follower amplifier with a voltage gain of 0.8, input impedance of 10kΩ and emitter resistance of 20Ω. Assume β=100, V_{CC}=2.5V, Is=10^{-16}A, V_A=∞.

1B. Assume I_S=2×10^{-17}A, V_A=∞, V_{BE}=0.8V and β = 100 in Fig. Q1 (B). What is the maximum value of R_C if the collector-base must experience a forward bias of less than 200mV?

1C. A transistor with I_S=6×10^{-16}A must provide a trans conductance of 1/(13Ω). What base-emitter voltage is required?

(5+3+2)

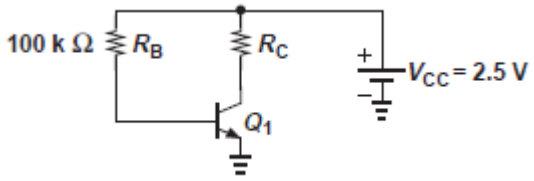

Fig.Q1(B)

2A. Design the degenerated stage of Fig. Q2(A) with a voltage gain of 10 with Q_1 operating at the edge of saturation. Calculate the bias current and the value of R_C if β = 100, I_S=5×10^{-16}A, and V_A=∞. Calculate the input and output impedance of the circuit.

2B. In Fig. Q2(B), identify the region in which the MOSFET operates

2C. Determine R_{in} and R_{out} for the circuit in Fig. Q2(C). Do not neglect Channel Length Modulation.

(5+3+2)

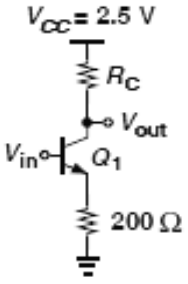

Fig. Q2(A)

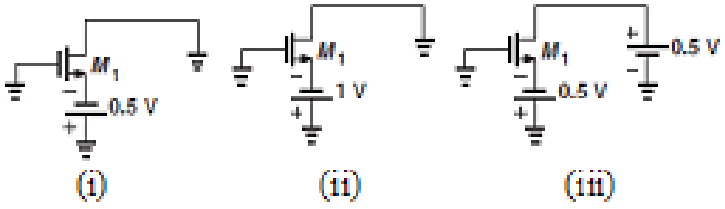

Fig. Q2(B)

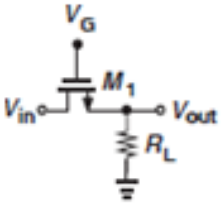

Fig. Q2(C)

3A. Design the CS stage shown in Fig. Q3(A) for a voltage gain of 5, an input impedance of 50kΩ, and a power budget of 5mW. Assume $\mu_n C_{ox} = 100\mu A/V^2$, $V_{TH} = 0.5V$, $\lambda = 0$, and $V_{DD} = 1.8V$. Also, assume a voltage drop of 400mV across R_S.

3B. Determine the pole frequency for the circuit shown in Fig. Q3(B). Consider all possible junction capacitors and neglect channel length modulation

3C. For the circuit in Fig. Q3(C), obtain an expression for the voltage gain.

(5+3+2)

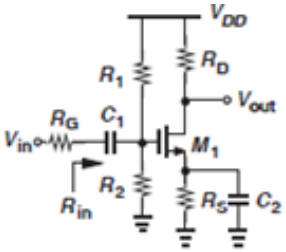

Fig. Q3(A)

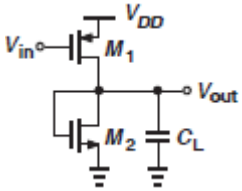

Fig. Q3(B)

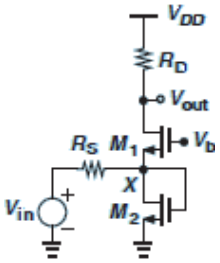

Fig. Q3(C)

4A. Find the closed loop gain, I/O resistances of the circuit shown in **Fig. Q4(A).**

4B. Determine the polarity of feedback for the circuit shown in **Fig. Q4(B).**

4C. Determine the transfer function of a first order low pass filter using RC network and plot the frequency response.

(5+3+2)

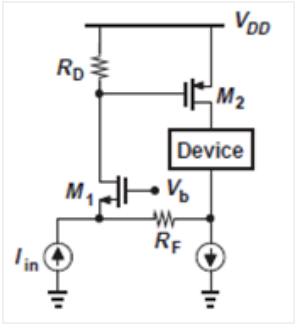

Fig. Q4(A)

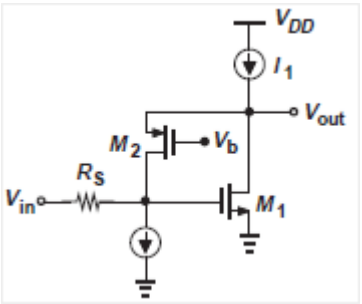

Fig. Q4(B)

5A. Derive the oscillating frequency of a Collpitts oscillator.

5B. Determine the power efficiency of Class A amplifier and explain how it can be improved in Class B amplifier.

5C. List the different classes of power amplifiers and mention their features.

(5+3+2)