Exam Date & Time: 26-Apr-2022 (02:00 PM - 05:00 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

DEPARTMENT OF INSTRUMENTATION AND CONTROL ENGINEERING THIRD SEMESTER B.TECH MAKEUP EXAMINATIONS, APRIL 2022

ANALOG ELECTRONIC CIRCUITS [ICE 2151]

A

Duration: 180 mins.

(5)

Answer all the questions.

Instructions to Candidates: Answer ALL questions. Missing data may be suitably assumed
 Explain channel length modulation and different region of operations of MOSFET with suitable

- I Explain channel length modulation and different region of operations of MOSFET with suitable diagrams. Derive an expression for I_{Dmax}
 - A)

Marks: 50

- B) With the help of equivalent circuits, derive the expression for input and output impedance of a common gate FET amplifier (3)
- C) Calculate the small signal voltage gain of the following network if $V_{DD}=1.8V$, $I_D=1mA$, $\mu nCox = 100\mu A / V^2$, $V_{TH}=0.5V$ (2) and $\lambda = 0$. Verify that M1 operates in saturation region





Explain the concept of cascode current source in FET amplifier. Due to a manufacturing error, a CMOS cascode amplifier has been configured as shown below. Calculate voltage gain of the circuit.

$$V_{b4} \leftarrow \downarrow \downarrow \downarrow \downarrow M_4$$

$$V_{b3} \leftarrow \downarrow \downarrow \downarrow M_3$$

$$V_{b2} \leftarrow \downarrow \downarrow M_2$$

$$V_{b1} \leftarrow \downarrow \downarrow M_1$$

	B)	With the help of small signal analysis, derive the expression for voltage gain of a source follower	(3)
	C)	Explain the concept of current mirrors in FET amplifier	(2)
3)		Using miller's approximation, find the pole frequency of a common source amplifier (with R_G and R_D) and draw it's frequency response using Bode's rule	(5)
	A)		
	B)	Derive the expression for input and output impedance of a degenerated common source stage FET amplifier.	(3)
	C)	Sketch the basic construction of PMOS transistor. Highlight its operation in triode and saturation region using I-V characteristics.	(2)
4)		What do you mean by sense and return mechanisms in feedback amplifiers? Illustrate with examples	(5)

2)

A)

(5)

A)

B) Compute voltage gain of the following circuit



Calculate the oscillating frequency of a FET Colpitts oscillator with $C_1 = 750$ pF, $C_2 = 2500$ pF, L = 40C) μH (2) 5) State and explain cross over distortion in class B power amplifiers. With the suitable diagram, explain how to avoid this distortion (5) A) B) Prove that Class A power amplifier achieves a maximum efficiency of 50% (3) C) Calculate the efficiency of class B power amplifier for a supply voltage $V_{cc} = 24V$ with peak output (2) voltage $V_{LP} = 22V$

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