Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER M.TECH DEGREE EXAMINATION (Regular), JULY 2022

VLSI AND EMBEDDED SYSTEMS

(2021 Scheme)

Course Code: **21VE201**

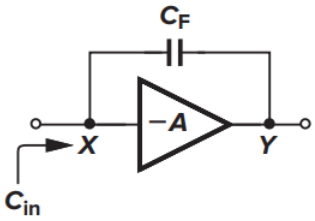
Course Name: **Analog Integrated Circuits**

Max. Marks: **60** **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Explain 'Analog design octagon' in connection with the design of an amplifier.
2. Discuss about the current copying action of a basic current mirror circuit.
3. Obtain the expression for sensitivity of V_{REF} to V_{DD} in a Resistor-MOSFET Voltage divider reference circuit.
4. Draw the circuit of a Source coupled pair differential amplifier and obtain the expressions for the output currents (iD1 and iD2) flowing through both branches.
5. State and Prove Miller's theorem.
6. Find out the input capacitance of the amplifier shown in figure which has a negative gain equal to −A.



7. Discuss about Amplitude distribution of noise? Give one example.
8. What is thermal noise? How the thermal noise in a resistor can be modelled by a series voltage source?

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE I

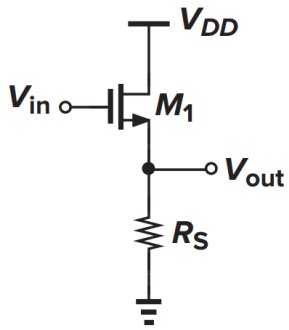
9. a) What is a diode connected MOS? Find out the impedance created by such an arrangement using small signal analysis. Assume that channel length modulation and body effect exists in the MOS. (3)

   b) If a diode connected nMOS transistor is connected as the load for a CS stage amplifier, find out the Voltage gain of the resultant amplifier circuit. (3)

OR

10. a) Derive the Voltage gain of a CS stage using nMOS transistor, with a degeneration resistor at the source without considering channel length modulation and body effect. (3)

b) Analyze the given circuit using small signal model and obtain an expression for its voltage gain. Neglect channel length modulation.



(3)

MODULE II

11. a) Draw a simple current mirror circuit and derive an expression for the ratio of output current to input reference current, if channel length modulation exists in the MOS devices. (2)

b) Analyze the circuit of a Cascode current mirror using small signal model and find out its output impedance. Compare it with the impedance of simple current mirror. (4)

OR

12. Draw the circuit of Wilson current mirror and obtain its small signal model. Derive an expression for the output impedance of the circuit. (6)

MODULE III

13. Draw a supply independent reference circuit using MOS devices. Derive an expression for the output current. Explain the startup problem observed in this circuit and how it can be resolved. (6)

OR

14. a) What is bandgap reference circuit? Draw the circuit of a practical implementation method. (3)

b) What is constant - gm biasing? Explain with the help of a basic circuit. (3)

MODULE IV

15. Draw the circuit of a CMOS differential amplifier with current source load. Derive the common mode range (CMR) and the small signal gain of this differential amplifier. (6)

OR

16. Explain the working of a wide swing differential amplifier. Draw the circuit and write the expression for gain. (6)

MODULE V

17. Draw the high frequency model of a common source stage. Deduce the transfer function. Find the poles associated with it? (6)

OR

18. Derive the transfer function of a common drain stage at high frequency. Draw its high frequency equivalent circuit. (6)

MODULE VI

19. Explain the concept of correlated and uncorrelated noise sources. Write necessary expressions and explain with the help of diagrams. (6)

OR

20. List out the basic properties of feedback circuits and explain each. (6)

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