KUMARAGURU college of technology
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Register Number:……

M.E DEGREE EXAMINATIONS: JUNE 2018

(Regulation 2015)

Second Semester

APPLIED ELECTRONICS

P15AET201: Analog Integrated Circuit Design

COURSE OUTCOMES

CO1: Analyze various voltage and current sources

CO2: Compare different amplifier types in terms of their gain, frequency response and Noise Elimination

CO3: Examine the functions of the internal circuits of single stage and two stage op amps

CO4: Evaluate the stability and frequency compensation techniques for Op Amps

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The technique used to reduce the power supply sensitivity in voltage reference is ----- ---------- CO1 [K_2]

   a) Zener reference
   b) Thermal voltage
   c) Bootsrapping Technique
   d) Constant $G_m$biasing

2. Active load is used in differential amplifier to---------- CO1 [K_2]

   a) Increase the output resistance
   b) Provide symmetry
   b) Handle large signals
   d) Increase the bandwidth

3. Miller effect capacitance C_M is CO2 [K_2]

   a) $(1-A_V)\ C_f$
   b) $(A_V -1)\ C_f$
   c) Ten times C_f
   d) $(1+A_V)\ C_f$

4. Match List I with List II CO2 [K_2]

List I	List II
A. The input impedance of common source stage	1. The input device and cascode device need not be of the same type
B. Folded cascode structure	2. a property of cascode structure
C. A high output impedance is	3. Large signal behaviour
D. Input –output characteristics of amplifier	4. $Z_{in}= 1/ [C_{GS}+(1+g_mR_D)C_{GD}]s$

	A	B	C	D
a)	ii	i	iii	iv
b)	iii	iv	ii	i
c)	ii	iv	iii	i
d)	iii	i	ii	iv

5. Assertion (A): Less feedback is applied so that gain crossover moves closer to origin CO4 [K_2]
Reason (R): The gain crossover must occur well before the phase crossover for stable system

a) Both A and R are Individually true and R is the correct explanation of A
b) Both A and R are Individually true but R is not the correct explanation of A
c) A is true but R is false
d) A is false but R is true

6. The current voltage feedback network CO3 [K_2]

a) Samples the output voltage and returns the feedback signal as voltage
Senses the output current and returns voltage
c) Senses the output voltage and returns current
Senses the output current and returns current

7. The stability of a feedback system is dependent on CO3 [K_2]

1. Number of poles in the system
2. Number of stages in the system
3. Number of devices used in the system
4. Load condition.

a) 1,3
b) 1,4
c) 1,2
d) 2,3

8. Assertion: The op amp topology with differential output doesn't suffer in terms of stability of feedback system CO4 [K_3]
Reason: The differential output topology has a mirror pole.

a) Both A and R are Individually true and R is the correct explanation of A
b) Both A and R are Individually true but R is not the correct explanation of A
c) A is true but R is false
d) A is false but R is true

9. The quantity that play an important role in feedback system making the closed loop gain insensitive to variations in device parameters is ---------- CO3 [K_2]

a) bandwidth
Loop gain Aβ
c) Terminal impedance
Pole frequency

10. Determination of transfer function for analyzing frequency response of an amplifier involves CO4 [K_2]

1. Identify all of the capacitance in the circuit
2. Fixing appropriate nodes in the circuit
3. Surmise the transfer function
4. Associating one pole with each node

a) 2-3-4-1
b) 2-1-4-3
c) 3-4-2-1
d) 4-1-3-2

PART B (10 x 2 = 20 Marks)

11. How do we generate copies of reference current which does not allow dependencies on process and temperature? Justify. CO1 [K_4]

12. Write the significance of bandgap voltage reference. CO1 [K_2]

13. Draw the small signal equivalent circuit of source follower and write the expression for voltage gain. CO2 [K_2]

14. Compute the zero S_Z which arises from the direct coupling of the input to the output through C_{GD} in CS stage with help of suitable circuit. CO2 [K_3]

15. List the types of noise and its effect on analog circuits. CO2 [K_2]

16. Draw the simple implementations of four types of feedback amplifiers. CO3 [K_2]

17. Write the expression for the input referred noise voltage per unit bandwidth of telescopic op-amp. CO3 [K_2]

18. What are the advantages of folded cascade operational amplifier. CO4 [K_2]

19. What are the two approaches to be followed in order to achieve stability in operational amplifier. CO4 [K_2]

20. Write the significance of pole splitting and zero cancellation in two stage op amp. CO4 [K_2]

PART C (6 x 5 = 30 Marks)

21.	Discuss on constant G_m biasing.	CO1	[K_2]
22.	With schematic and expressions explain MOS cascode current mirror.	CO1	[K_2]
23.	For common gate stage calculate the input impedance and write why Z_{in} becomes independent of C_L as capacitance increases.	CO2	[K_3]
24	State Millers theorem and illustrate how it can be applied to a circuit with an Example.	CO3	[K_2]
25.	Illustrate the technique for eliminating or moving right half plane zero in two stage CMOS op amp.	CO3	[K_3]
26.	Discuss the concepts of gain and phase margins with respect to stability.	CO4	[K_3]

Answer any FOUR Questions

PART D (4 x 10 = 40 Marks)

27.	Design a self-biased V_{BE} referenced bias circuit with necessary diagrams and test the supply independence of output currents.		CO1	[K_3]
28.	Discuss the high frequency behavior of Differential amplifier with active current source load.		CO2	[K_2]
29.	Analyze the telescopic op- amp with circuit schematic and estimate the relative position of the poles.		CO3	[K_2]
30.	i) Discuss the noise models of the various integrated circuit components.	(4)	CO2	[K_2]
	ii) Analyze the slewing characteristics of two stage operational amplifier circuit.	(6)	CO3	[K_2]
31	Explain &Analyze the Miller frequency compensation technique for two stage operational amplifier in detail.		CO4	[K_2]

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