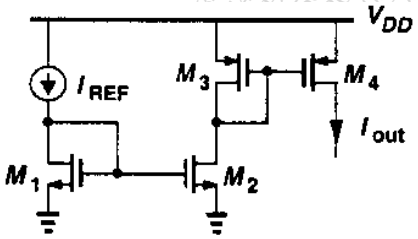
Time: 3 Hours **Max Marks: 80**

N.B. 1) Question No.1 is compulsory
2) Solve any three questions from the remaining questions.
3) Assume suitable data if necessary.

1 Solve any four

(a) For an NMOS device operating in saturation, plot W/L versus V_{GS}-V_{TH} if **5**
a. I_D is constant
b. gm is constant

(b) Find the drain current of M4 if all transistors are in saturation **5**



(c) Compare full custom and semi-custom design in terms of its trade-offs and applications **5**

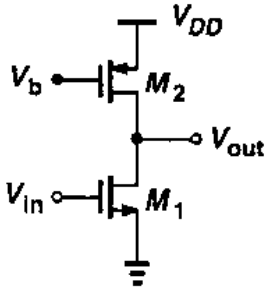
(d) Explain Non-ideal effects in PLL. **5**

(e) Compare various op amp topologies **5**

2 (a) Compare common source amplifier with following loads **10**

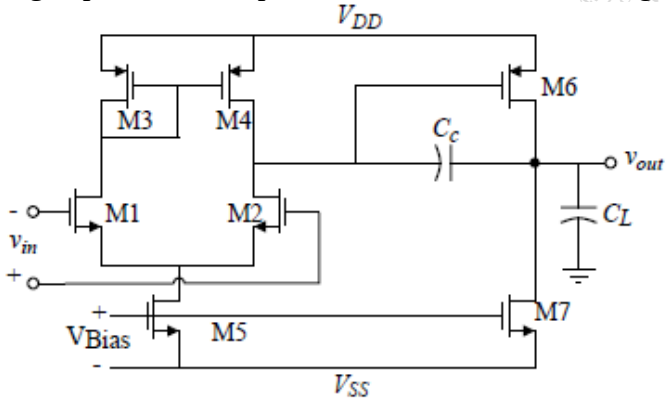
a) NMOS diode connected load
b) PMOS diode connected load
c) Current source load
d) Triode load

(b) **10**



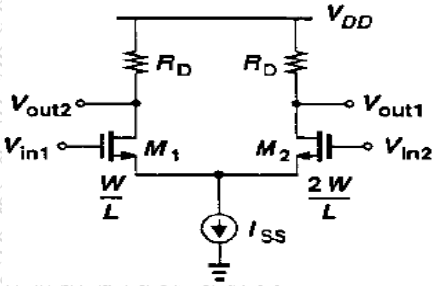
a. Redraw the above circuit using thermal noise current source
b. Write the expression for total output thermal noise voltage
c. Write the expression for output thermal noise voltage referred to the gate of M1
d. Why should gm_1 be maximized and gm_2 be minimized in the above circuit.

3 Design two stage operational amplifiers that meet the following specifications **20**



Av > 3000V/V V_{DD} =2.5V V_{SS}=-2.5V
Gain Bandwidth = 5MHz, Slew Rate > 10V/µs, 60° phase margin,
0.5V< V_{out} range <2V,
ICMR = -1.25V to 2V,
$P_{diss} \leq 2$ mW, C_L=10pF
Use $K_N' = 100\mu A/V^2$, $K_P' = 20\mu A/V^2$, $V_{TN} = |V_{TP}| = 0.5V$, $\lambda_N = 0.06V^{-1}$,
$\lambda_P = 0.08V^{-1}$, Cox=2.47fF/µm^2.
Verify that the designed circuit meets required voltage gain and power dissipation specifications

4 (a) Analyze following circuit to get voltage gain equation if M_2 is twice wide as that of M_1 and Vin_1=Vin_2 **10**



(b) Derive the expression Voltage gain Av and Output impedance Ro for Source follower circuit **10**

5 (a) Derive equation of differential gain, common mode gain and CMRR of a differential amplifier circuit. **10**
(b) Explain the switched capacitor amplifiers in detail with appropriate diagrams **10**

6 Write short notes on (any four)
(a) Charge pump PLL **5**
(b) Stability and frequency compensation of two stage Opamp **5**
(c) Band Gap references **5**
(d) Performance parameter of VCO **5**
(e) AMS Design flow **5**

****

[Time: 3 Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B: 1. Q. l is compulsory.
2. Attempt any three out of remaining questions.
3. Assume suitable data wherever required and justify the same.

Q.1 Attempt **any four**.

a) What is MEMS? What is significant difference between Microelectronics and Microsystem? **20**

b) Discuss the role of SU8 in MEMS applications.

c) Define TCR & Stiffness and its significance wrt to MEMS

d) What is Etch stop? Discuss it's techniques.

e) Describe the phenomenon of Stiction, and possible ways to avoid it.

Q.2 a) Discuss the process flow of Photolithography. Explain the types of photoresist used. **10**

b) Explain silicon crystal structure. Why silicon is used as substrate material in MEMS? **10**

Q.3 a) Explain in details application of Polymers in MEMS. Why and How to make polymer conductive. **10**

b) What are the design considerations in Selection of MEMS materials? **10**

Q.4 a) Describe the process flow for fabricating micro heater. Also explain its working principle. **10**

b) List the types of pressure sensor and show the process steps for fabricating the piezoresistive pressure sensor. **10**

Q.5 a) What is MEMS micromachining? Explain in details fabrication process flow of LIGA. Why electroplating is necessary in LIGA process. **10**

b) Compare Deposition techniques used in MEMS with respect to their applications. **10**

Q.6 Write Short note on **20**

a) Wire bonding
b) MEMS Reliability
c) Annealing
d) Sensors in Biomedical Applications

****

[Time : 3 Hours] **[Marks : 80]**

Please check whether you have got the right question paper.

N.B:
1. Question **No.l** is **compulsory**.
2. Solve any **three** questions from remaining **five** questions.
3. **Draw** neat **diagrams** and assume suitable data wherever necessary. Justify your assumptions.
4. **Figures** to the **right** indicate full **marks**.

1. Solve any **four** **20**

a) What is the need of DWDM ? Brief working principle.
b) In ATM, what is difference between UNI & NNI? Explain frame format.
c) How SNAT works in network security?
d) Explain the need of WSN ? Explain different components used in WSN.
e) How zigbee Technology works? How is it better than Blue tooth?

2. a) Which bit of frame relay frame format is used to avoid congestion in network? Draw and explain Frame format of Frame Relay. **10**

b) How firewall helps to provide security? Explain any 2 types of firewall along with Limitations and advantages. **10**

3. a) How to provide security to network? Explain with different security safeguards and threats. **10**

b) Describe Bluetooth protocol stack in detail along with neat diagram. **10**

4. a) Briefly explain functions of all ATM adaptation Layer Protocols. **10**

b) What is the difference between ubiquitous access and hierarchical access? **10**

5. a) Classify SNMP w.r.t. network management. **10**

b) Give explanation of different Traffic Descriptor and parameters w.r.t. ATM. **10**

6. Write short notes on any **four** **20**

a) OAMP w.r.t network management
b) Function of VPI & VCI in ATM
c) SONET Frame format
d) SNAT & DNAT
e) Rmon

[Time: 3Hrs] **[Marks: 80]**

Please check whether you have got the right question paper.

N.B:
1. Question number 1 is compulsory.
2. Solve any THREE out of remaining
3. Assume suitable data if necessary
4. Figures to the right indicate full marks

Q. 1 Attempt **any FOUR**

a) What is frequency reuse concept **(05)**
b) Explain the 2.5 G TDMA Evolution Path. **(05)**
c) Give the Comparison of the different types of multiple access techniques used in Mobile Communication **(05)**
d) Explain pulse shaping in OFDM **(05)**
e) Compare the WCDMA and CDMA-2000 technologies **(05)**

Q. 2 a) Explain the coverage and capacity improvement techniques for cellular system. **(10)**
b) Explain different traffic channel and control channels in GSM **(10)**

Q. 3 a) Explain signal processing in GSM. **(10)**
b) Explain the GPRS network architecture **(10)**

Q.4 a) Explain the advantage of spreading the spectrum in CDMA. Explain direct sequence spread spectrum with block diagram **(10)**
b) Explain variable data transmission and power control in CDMA **(10)**

Q. 5 a) Explain4G-LTE architecture giving a neat block diagram. **(10)**
b) Explain the ADHOC routing protocols for MANET. **(10)**

Q. 6 Write short notes on **any FOUR** **(20)**

a) Authentication and security in GSM
b) Trunking and GoS
c) Mobility and resource management in CDMA
d) RAKE Receiver
e) WSN

****

[Total Marks:80]

(3 Hours)

NB.

(1) Question No.1 is compulsory.
(2) Attempt any three questions from remaining.
(3) All questions carry equal marks.
(4) Assume suitable data wherever necessary.

Q.1 Answer any **four** of the following**:**

a) Define Kinematic Parameters. (5)
b) Explain the conditions for the existence of Inverse Kinematics problem. (5)
c) Explain repeatability, precision and accuracy. (5)
d) Discuss briefly on wave front planner. (5)
e) Differentiate between path and trajectory. (5)

Q.2 a) Obtain the inverse kinematic analysis of a 3 axis planar articulated robot (10)

b) Give the steps involved in constructing homogeneous transformation matrix which maps frame k coordinates into frame k-1 coordinates and obtain the link coordinate transformation matrix T mapping coordinate frame k to coordinate frame k-1. (10)

Q.3 a) With a suitable example explain differential motions of a frame with respect to (10)
i. Differential Translation
ii. Differential Rotation
iii. Differential Transformations

b) What is Visibility graph? Explain an algorithm to construct visibility graph. (10)

Q.4 a) Explain robot motion planning using Bug 1 and Bug 2 algorithm. (10)
b) What is a GVD? Sketch all the GVD's resulting due to the basic interactions of the obstacle .Derive the necessary equations. (10)

Q.5 a) Explain Joint Space Trajectory Planning using third order polynomial. (10)
b) Explain iterative processing operators with examples. (10)

Q.6 Write short notes on any **four** of the following: (20)
a) Jacobian.
b) Tool Configuration Vector
c) Robot Classifications.
d) Lagrangian Mechanics.
e) Homogeneous Coordinate Transformations.