BE Sem VIII Etrx (CBGS) 12/05/16

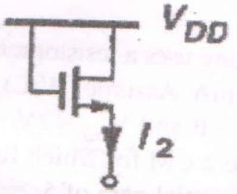
CMOS VLSI Design.

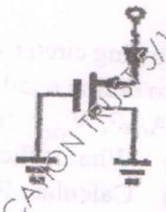
Q.P. Code : 719702

(3 Hours) **[Total Marks : 80**

N.B. :
(1) Question **ONE** is **compulsory**.
(2) Solve **any THREE** out of remaining **questions**.
(3) Draw **neat** and **clean diagrams**.
(4) Assume **suitable data** if **required**.

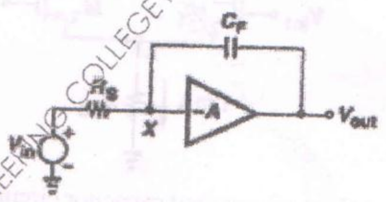
1. (a) Will the following circuits work as current sources? Give the correct reason for your answer. 5





(b) List down the performance parameters of VCO and explain trade off between them. 5

(c) Calculate the pole associated with the node X shown in the following figure. Assume $R_S = 1K\Omega$, $C_F = 0.1pF$ and $A = 10$. 5



(d) Draw and explain the floor plan for a possible mixed signal chip. 5

2. (a) Show the op-amp based implementation of temperature independent bandgap reference and various issues involved thereof. 10

(b) For common source stage with diode connected load, if the variation of $\eta = (g_{mb}/g_m)$ with the output voltage is neglected then prove that the gain is independent of bias currents and voltages. 5

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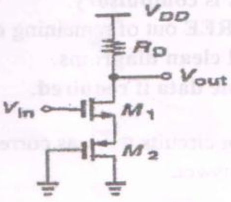
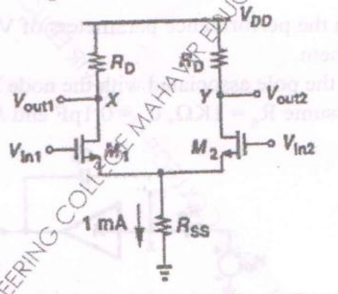
(c) Assuming $\lambda = \gamma = 0$, calculate the small signal gain of the circuit shown: 5



3. (a) The following circuit shown in Figure uses a resistor rather than a current source to define a tail current of 1mA. Assume $(W/L)_{1,2} = 25/0.5$, $\mu_n C_{ox} = 50\ \mu A/V^2$, $V_{TH} = 0.6$ V, $\lambda = \gamma = 0$ and $V_{DD} = 3$V. 10
   (a) What is the required input CM for which Rss sustains 0.5V?
   (b) Calculate R_D for a differential gain of 5.



(b) Explain the concept of switched capacitor circuit. Draw and explain discrete time integrator along with the output waveform. 10

4. (a) With the use of small signal behaviour, prove that for differential pair the magnitude of differential gain is equal to $g_m R_D$ regardless of how the inputs are applied. 10
   (b) What is the need of compensating operational amplifiers? Explain the compensation of two stage operational amplifiers? 5
   (c) Derive an expression for the input referred noise voltage of common source stage. 5

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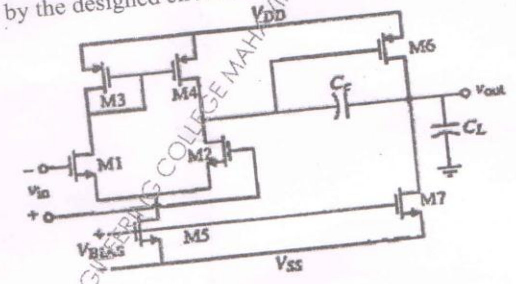
5. (a) Design two stage Operational Transconductance Amplifier (OTA) similar to that shown in the figure to meet the following specifications with a phase margin of 60° : 15

$A_V > 5000$ V / V
$V_{DD} = 2.5$ V
$V_{SS} = -2.5$ V
Gain Bandwidth (GB) = 10MHz
$C_L = 10$pF
Slew Rate (SR) > 10 V/μs
V_{out} range = ± 2.5 V
ICMR = −1 to 2 V
$P_{diss} \leq 2$ mW

Use the following table for material and device parameters. Assume $C_{OX} = 2.47$ fF/μm^2.

Parameter	n - channel	p - channel	Unit
V_{TO}	0.7 ± 0.15	-0.7 ± 0.15	V
K'	110	50	μA/V^2
λ	0.04	0.05	V^{-1}

Verify that the voltage gain and power dissipation given in the specifications are met by the designed circuit.



(b) Explain charge-pump PLL. 5

6. (a) Compare the performance of various op-amp topologies. 5
(b) Explain the input-output characteristics of phase detector (PD) circuit. 5
(c) Explain the concept of clock feedthrough. 5
(d) Compare between full-custom and semi-custom design. 5

VIII - EC

Elec. Robotics

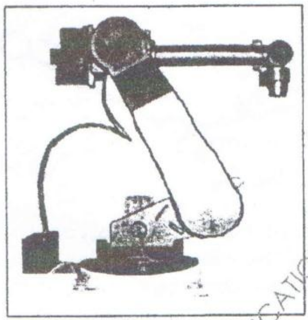
QP CODE : 732400

(3 Hours) [Total Marks: 80]

N. B.:
1. Question No. 1 is compulsory.
2. Attempt any three questions from the remaining five questions.
3. Assume suitable data if necessary.
4. Figures to the right indicate full marks.

Q.1. Answer following questions in brief.

a Draw the approximate workspace for the following robot. Assume the dimensions of the base and other parts of the structure of the robot are as shown below. (05)



b A point $P(7,3,1)^T$ is attached to the frame F and is subjected to following transformations. Find the coordinates of the point relative to reference frame at the conclusion of transformations. (05)

i Rotation of 90^0 about the z-axis

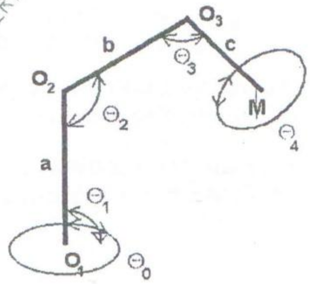
ii Followed by a rotation of 90^0 about y-axis

iii Followed by a translation of [4,-3,7]

c What is potential function? How it is used for navigation of robot? (05)

d What is thresholding? Explain with suitable example. (05)

Q.2. a A 3-DOF robot arm has been designed for applying paint on flat walls, as shown below. (15)



- Assign coordinate frame as necessary based on the D-H representation.
- Write parameter table.

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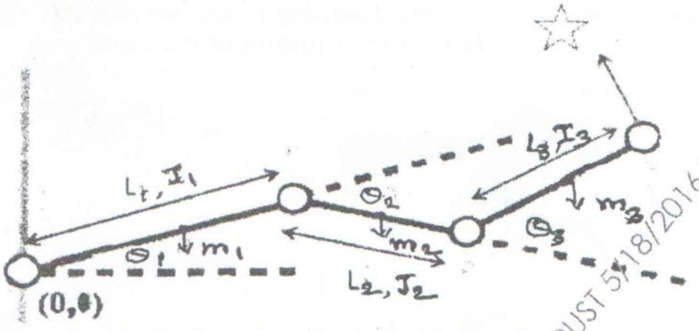
- Write all A matrices.
- Find the ${}^{U}T_H$ matrix.

b Define the following terms (05)

- Euler angles
- Articulated joints

Q.3. a Derive the equations of motion for the system shown below: (08)



b A camera is attached to the hand frame T_H of a robot as given. The corresponding inverse Jacobian of the robot at this location is also given. The robot makes a differential motion described as $D = [0.05 \quad 0 \quad -0.1 \quad 0 \quad 0.1 \quad 0.03]^T$. (12)

i Find which joints must make a differential motion, and by how much, in order to create the indicated differential motion

ii Find the change in the Hand frame

iii Find the new location of the camera after the differential motion

iv Find how much the differential motion should have been instead, if measured relative to Frame T_H, to move the robot to the same location as in part (iii)

$$T_H = \begin{bmatrix} 0 & 1 & 0 & 3 \\ 1 & 0 & 0 & 2 \\ 0 & 0 & -1 & 8 \\ 0 & 0 & 0 & 1 \end{bmatrix} \qquad J^{-1} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 2 & 0 & -1 & 0 & 0 & 0 \\ 0 & -0.2 & 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

Q.4. a Explain Tangent Bug algorithm and compare it with Bug2 algorithm. (10)

b Explain Brushfire algorithm. Discuss local minima problem. (10)

Q.5. a What is GVD? Explain sensor-based construction of GVD. (10)

b Explain how you will generate Cartesian-space trajectories. Give simple example. (10)

Q.6. Write short notes on

a Forward and Inverse kinematics (05)

b Langragian Mechanics (05)

c Visibility graph construction (05)

d Wave-front planner (05)

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VIII ETRX Mobile Comm^n CBGS 18/5/16

QP Code : 728300

(3 Hours) **[Total Marks :80**

N.B. : (1) Question No. **1** is **compulsory.**
(2) Attempt **any three** questions out of the remaining **five** questions.

1. Answer the following:- **20**
   - (a) Explain the soft, softer and soft-softer handoff.
   - (b) Explain umbrella cell approach in cellular system
   - (c) Explain the services and features of GSM.
   - (d) Discuss the need for 3G cellular networks.

2. (a) Explain the UMTS network architecture in detail with interfaces. **10**
   (b) Explain the CDMA 2000 technologies. **10**

3. (a) Explain the frame structure for GSM. **10**
   (b) Explain the following for GSM:
   - (i) Diagonal interleaving **2**
   - (ii) Ciphering **2**
   - (iii) SIM **2**
   - (iv) IMSI number **2**
   - (v) Short Message Service (SMS) **2**

4. (a) Explain the 4G LTE architecture with a neat block diagram. **10**
   (b) Discuss Mobile IP in detail. **10**

5. (a) With a neat block diagram explain the forward traffic channel processing in COMA. **10**
   (b) Consider a cellular system in which the total available voice channels to handle traffic are 480. The area of each cell is 5sq.km and the total coverage area of the system is 3000 sq.km. **10**
   - (i) For the cluster size of 7, find the no. of channels per cell, no. of clusters, and the system capacity.
   - (ii) For the cluster size of 4, repeat the above calculations
   - (iii) Comment on the result

6. Write short notes on any **four**: **20**
   - (a) WSN
   - (b) GPRS
   - (c) Trunking and GOS
   - (d) Mobility and resource management in CDMA
   - (e) Erlang B and Erlang C system

VIII- ETRX (CBGS) MEMST 24/5/16

Q. P. Code : 731501

3 Hours Max Marks: 80

N.B.

1) Q. No. 1 is compulsory.
2) Attempt any three out of remaining questions.
3) Assume any suitable data wherever required but justify the same.

1 a Give few examples of MEMS device which are characterized by sensors and actuators. 20

b Explain the sacrificial layer and its role in fabrication of MEMS devices

c What are the characteristics of Micro-heater?

d In case of photolithography, Compare the two types of photo-resist used

2 a Discuss the process of photolithography. Mention the types of photolithography suitable for at least two MEMS devices with justification. 10

b Discuss selection of material based on applications. Support your answer by considering suitable example. 10

3 a A 30 μm thick membrane is needed for a pressure sensor application. Calculate the size of the mask opening W needed for the V groove if the full wafer thickness is 600 μm using an-isotropic (Tan 54.74^0) etching below the silicon <100> surface. 10

b Explain Dry etching & Wet etching in fabrication process of MEMS devices. 10

4 a Describe the representative process flow for fabricating the ink jet printer head by Hewlett-Packard. Also explain the operating principle of this MEMS device in detail. 10

b Differentiate between bulk and surface micromachining for fabrication of MEMS devices with suitable example 10

5 a State various Chemical Vapor Deposition Techniques. Explain in brief the techniques of Chemical Vapor Deposition for MEMS device fabrication. 10

b Explain transduction pertaining to microfilm strain gauge. State the factors that lead to thin film stress 10

6 Write a short note on (any three) 20

a Photolithography(Compare major types of exposure system)

b Anodic bonding

c Reliability of MEMs devices.

d Applications of MEMS in Biomedical Instrumentation

Q.P. Code : 733701

(3 Hours) **[Total Marks : 80**

N.B.: (1) Question **No. 1** is **compulsory**.
(2) Attempt **any Three** from the remaining.
(3) **Figures** to the **right** indicate **full marks**.
(4) Assume suitable **data** wherever **required**.

1. Attempt **any Four** from the following : **20**
   - (a) Draw and describe ATM cell in detail.
   - (b) Explain SONET frame format with neat diagram.
   - (c) Describe the term DMZ.
   - (d) What is the need of DWDM ? Explain its working principle.
   - (e) Draw and explain different states of devices in Bluetooth.

2. (a) Describe ubiquitous and hierarchical access and compare them. **10**
   (b) With the neat diagram, explain frame format of Frame Relay, How congestion control is implemented in it. **10**

3. (a) Explain Bluetooth protocol stack. **10**
   (b) Explain ATM protocol architecture in detail. **10**

4. (a) Draw and explain IEEE 802.15.4 LR-WPAN Device architecture. **10**
   (b) With respect to network management, explain following terms : **10**
   - (1) Documentation
   - (2) OAM & P

5. (a) Explain network security threats and network security safeguards. **10**
   (b) What is firewall? What are the capabilities and limitation of firewall ? Discuss different types of firewall. **10**

6. Write a short note on **Any Four** : **20**
   - (a) NAT
   - (b) Role of VCI and VPI in ATM
   - (c) SNMP
   - (d) Steps for completing the Access N/W Design
   - (e) Packet filtering
