

[Time: 3 Hours]

[Total Marks: 80]

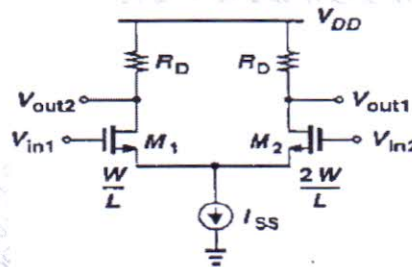
Note: 1) Question ONE is compulsory

2) Solve any THREE out of remaining questions

3) Draw neat and clean diagrams, wherever necessary

4) Assume suitable data, if required

- 1 (a) Analyze following circuit to get voltage gain equation if  $M_2$  is twice wide as that of  $M_1$  and  $V_{in1} = V_{in2}$  5



- (b) Explain importance of Miller Theorem 5
- (c) Explain input output characteristics of phase detector (PD) circuit 5
- (d) Draw and explain AMS design flow 5
- 2 (a) Derive expression for Voltage gain  $A_v$  and output resistance  $R_o$  of Source follower stage. 10
- (b) Explain in detail how to generate temperature independent references. 10
- 3 (a) Explain qualitative analysis of differential pair. 10
- (b) Explain concept of switched capacitor circuits and hence explain switched capacitor amplifiers in detail 10
- 4 (a) Explain common mode response of differential pair with necessary derivations 10
- (b) Explain White & Flicker noise in MOSFET. Derive equation for output and input referred noise voltage of CS stage 10

TURN OVER

- 5 Design two stage Operational Transconductance Amplifier (OTA) to meet following specifications- 20
- $A_V > 4000 \text{ V/V}$ ,  $V_{DD} = 2.5\text{V}$ ,  $V_{SS} = -2.5\text{V}$   $GBW = 6\text{MHz}$ ,  $C_L = 10\text{pF}$ ,  
 $SR > 10\text{V}/\mu\text{s}$ ,  $60^\circ$  phase margin,  $-2\text{V} \leq V_{out} \text{ range} \leq 2\text{V}$ ,  
 $ICMR = -1.125\text{V to } 2\text{V}$ ,  $P_{diss} \leq 2.5\text{mW}$   
 $U_{se}$ ,  $K_N = 110\mu\text{A}/\text{V}^2$ ,  $K_P = 50\mu\text{A}/\text{V}^2$ ,  $V_{TN} = |V_{TP}| = 0.7\text{V}$ ,  $\lambda_N = 0.04\text{V}^{-1}$ ,  
 $\lambda_P = 0.05\text{V}^{-1}$ ,  $C_{ox} = 2.47\text{fF}/\mu\text{m}^2$ . Verify that the designed circuit meets required Voltage Gain and Power Dissipation specifications.
- 6 (a) Give comparison between Full-custom and Semi-custom design 5  
 (b) Compare various opamp topologies 5  
 (c) Explain in detail charge pump PLL 5  
 (d) Write a short note on Gilbert Cell 5

\*\*\*\*\*



Please check whether you have got the right question paper.

- N.B:
1. Q1. Is compulsory.
  2. Attempt any three out of remaining.
  3. Assume any suitable data required but justify the same.

- Q1 a)** What is the need of Lift off method? Explain this method with proper diagrams. 20
- b)** What is the stiffness constant of microcantilever beam for following given dimensions and a point contact load applied at its tip.  $E=170\text{GPa}$ ,  $h(\text{thickness}) = 10\mu\text{m}$ ,  $w(\text{width})=2\mu\text{m}$  &  $L(\text{Length}) = 50\mu\text{m}$
- c)** Explain wafer bonding and its techniques.
- d)** Explain scaling of MEMS devices.
- Q2 a)** Explain any one MEMS device used in modern automobile systems with working principle and representative fabrication process steps. 10
- b)** Justify the need of PECVD with its proper schematic and explanation. 10
- Q3 a)** Explain fabrication of any one of the MEMS devices using Bulk micromachining technique. 10
- b)** Explain the importance of etch stop techniques with proper illustration. 10
- Q4 a)** Explain the fabrication process steps for microheater. State its advantages over conventional macro sized heater. 10
- b)** Name any two polymer materials for MEMS device fabrication. Also explain the importance of these polymer materials for MEMS device fabrication with suitable examples. 10
- Q5 a)** Describe the representative process flow for fabricating the Digital Micro mirror Device (DMD) by Texas Instruments. Also explain its working principle. 10
- b)** Define the term TCR. Also describe the method of characterization of TCR. 10
- Q6** Write Short notes on 20
- a) DRIE & its significance for MEMS device fabrication.
  - b) Surface micromachining
  - c) TCE of a material and its issues.
  - d) Si as a MEMS material

\*\*\*\*\*

**Q.P. Code: 24845**

**(3 Hours)**

**[Total Marks: 80]**

- N.B. (1) Question No. 1 is compulsory.  
 (2) Attempt any three questions from remaining.  
 (3) Assume suitable data wherever necessary.

- Q1)** Answer the following questions: (20)  
 a) Define the following terms: Tool Path, Tool Trajectory, Degree of Freedom, Precision and Accuracy. (05)  
 b) Define robot kinematic parameters. (05)  
 c) What are Generalised Voronoi Diagrams (GVD) and their use in motion planning. (05)  
 d) Explain perspective transformation and its relevance. (05)
- Q2)** a) Explain significance and use of DH algorithm. Develop DH representation of a four axis SCARA robot. (15)  
 b) Explain the significance of major and minor axes. (05)
- Q3)** a) Write a brief note on Robot classification. (10)  
 b) Develop the Inverse Kinematic solution for a two axis planar robot. (10)
- Q4)** a) Explain robot pick-and-place operation. (10)  
 b) Explain four fundamental operations for merging of frame K-1 with frame K. Obtain the general link coordinate transformation matrix T for mapping the (k-1)th frame into the kth frame. (10)
- Q5)** a) Explain robot motion planning using Bug 1 and Bug 2 algorithm. (10)  
 b) Explain role of line and area descriptors for analyzing shape of an object. (10)
- Q6)** Write short notes on any two: (10x2) (20)  
 (a) Potential functions.  
 (b) Wave front planner.  
 (c) Cartesian space trajectory.  
 (d) Template matching algorithm.



Q.P. Code :25968

[Time: Three Hours]

[ Marks:80]

Please check whether you have got the right question paper.

- N.B:
1. Question **No.1** is compulsory.
  2. Out of the remaining questions attempt any **three**.
  3. Figures in the bracket indicate maximum marks.

- Q.1 Answer **any four** of the following:
- a) What is the difference between the physical and logical channels of a GSM system? (05)
  - b) A large city with an area of  $1500 \text{ km}^2$  is covered with a 12-cell system each cell with a radius of 1.387 km each. If the total spectrum allocated is 28.5 MHz with a full duplex channel bandwidth of 25 MHz. How many cell sites would be required assuming regular hexagonal shaped cells? (05)
  - c) Compare GSM and GPRS technologies. (05)
  - d) Differentiate between hard hand off and soft hand off. (05)
  - e) What is the difference between active and passive RFID tags? (05)
- Q.2
- a) With the help of a neat block diagram, explain the working of GSM system architecture. (10)
  - b) What is frequency reuse? How does it influence the co channel interference? (10)
- Q.3
- a) A spectrum of 30 MHz is allocated to a wireless FDD cellular system which uses two 25 kHz simplex channels to provide full duplex voice and control channels. Compute the number of channels available per cell if a system uses, a) four cell reuse, b) seven cell reuse, c) 12 cell reuse and d) 13 cells reuse. (10)
  - b) With the help of a neat block diagram, explain the working of a reverse CDMA IS 95 modulation process for a single user. (10)
- Q.4
- a) Explain in detail the packet and frame formats of CDMA IS 95 system. (10)
  - b) What is WCDMA air interface? Give important parameters of it. (10)
- Q.5
- a) What is UMTS technology? Explain with the help of a neat block diagram (10)
  - b) Explain the evolution path towards LTE and give important features of LTE. (10)
- Q.6 Write short notes on **any four** of the following:
- a) Importance of PN sequences in CDMA IS 95 system. (05)
  - b) Wireless sensor networks (05)
  - c) RFID technology (05)
  - d) Speech coding in GSM (05)
  - e) Grade of service in mobile communication (05)

\*\*\*\*\*