(3 Hours)

Total Marks = 80

N.B.

1. Question No: 1 is compulsory.

2. Solve any three questions out of remaining questions.

3. Assume suitable data where necessary.

Q. 1 (a) Explain need of Assembler and compiler and their comparison.   05M

Q. 1(b) Draw and Explain the Flag register of 8086µp?   05M

Q. 1 (c) Write a program to display "P" on the screen of IBM PC. Use INT 21H function AH =02 and DL= character to display. Explain the logic of the program. How will you alter the character to be displayed?   05M

Q.1 (d) If 32K RAM (2 chips of 16K each) are interfaced with 8086. Assuming that last physical address of RAM is FFFFFH, what will be starting and end address of each chip?   05 M

Q.2 (a) Explain Maximum mode of 8086 µp. Draw timing diagram for Read operation in maximum mode.   10 M

Q.2 (b) Write a program to find maximum number from an array of 10 numbers. Assume that the numbers are 8 bit wide.   10 M

Q.3 (a) Describe the importance of 8257 DMA controller. Explain the Data transfer modes of 8257 DMA controller   10 M

Q.3 (b) Write a program to find strength of Even and Odd numbers among the series of 10 numbers.   10 M

Q.4 (a)Draw and Explain the interfacing of Math co-processor with 8086.   10 M

Q.4 (b) Draw and Explain the interfacing of ADC 0809 with 8086 Microprocessor using 8255.   10 M

Q.5 (a) Suggest hardware and write a program to generate a square wave at the output of DAC 08 which is interfaced with 8086 CPU. How will you ensure bottom edge of 0 V and upper edge

of 3.6 V for the square wave generated? Comment on method of changing the frequency of the square wave generated. 12 M

Q.5 (b) Draw and explain the Block diagram of microprocessor based system. 08M

Q.6 (a) Design an 8086 based system with 32K ROM (2 chips of 16K). Draw the memory map of the system designed. 10 M

Q.6 (b).Explain salient features of Programmable Interval Timer 8254. What are different modes of operations ? Explain in brief. 10 M

75E3C91507ACC2056BA8C0190DA421FF

Time: 3 hours   Marks: 80

NB.   1. Question No. **1** is **compulsory**.
       2. Attempt **any three** out of remaining five questions.
       2. Figures to right indicate full marks.
       3. Assume data wherever required and state it clearly.

Que.1 Answer the following (Any **Four**)   20
   a. Explain autocorrelation and covariance of random variable.
   b. What are the properties of CDF?
   c. What is Entropy of an information source? When is entropy maximum?
   d. Give a comparison between the basic digital modulation techniques (ASK, FSK and PSK).
   e. Explain role of hamming distance in error detection & correction?
   f. Justify/Contradict: Syndrome depends on error pattern and received code word.

Q2
   a. The nine symbols viz. A1, A2, A3, … A9 have corresponding probability of occurrences as
       0.12, 0.2, 0.08, 0.25, 0.02, 0.04, 0.06, 0.13, 0.1. Determine the Huffman code, calculate
       the average code word length, entropy and coding efficiency.   10
   b. Explain the working of Minimum Shift Keying, modulator and demodulator, with the help
       of block diagram and waveform.   10

Q3
   a. Linear block code having following parity check equations –   10
       $c4=d1+d2+d3$, $c5=d1+d2$, $c6=d1+d3$. Calculate G & H matrix, error detection &
       Correction capacity of the code, decode the received codeword-------101100
   b. Derive the expression for the probability of error of the matched filter.   10

Q4
   a. Discuss the problem of inter symbol interference (ISI). Explain the measures to be taken
       to reduce ISI. How to study ISI using eye pattern?   10

   b. Generator vectors of convolution encoder are $g1=101$, $g2=110$, $g3=011$. Draw encoder,
       State table, State diagram & code trellis. Calculate the code word for the message
       vector 101011.   10

Q5
   a. What are the random processes? Explain Central limit theorem.   10
   b. Justify that distance of 16-QAM is greater than 16-Ary PSK & less than QPSK.   10

Q6   Write a short note on (**Any Three**)   20
   a) Nyquist criterion for zero ISI
   b) Systematic and non-systematic block codes
   c) Power spectral density and bandwidth of 16-Ary PSK.
   d) Coherent and non-coherent digital detection techniques.

****

58761

Duration : 3 Hours   Marks : 80

1] Question no. 1 is Compulsory
2] Attempt any three questions out of remaining questions
3] Assume suitable data if require

Q1   **Attempt any Four**   (20 Marks)
a)   Calculate charge density due to electric flux density $\bar{D} = 4r \sin \emptyset \, \widehat{a_r} + 2r \cos \emptyset \, \widehat{a_\emptyset} + 2z^2 \widehat{a_z} \, C/m^2$
b)   Obtain point format of Continuity equation
c)   Express Biot Savart's law in vector format
d)   For parallel plates capacitor with plate area $10 cm^2$ and plates saperation 3mm has voltage of $100 \sin 10^3 t \ V$ applied to its plates. Calculate displacement current density ($\varepsilon = 2\varepsilon_0$)
e)   Define following terms:
       • Uniform Plane waves
       • TEM wave
f)   Define the term Characteristic Impedance, Write expression for the same for Lossy and Lossless lines
g)   Show that $\bar{E} = -\nabla V$

Q. 2   (20 Marks)

a)   A sheet charge of $\rho_s = 2nC/m^2$ located at $x = 2$ in free space and line charge $\rho_l = 20nC/m$ is located at $x = 1 \& z = 4$, find electric field at the origin and direction of electric field at (4,5,6)
b)   For infinite long conductor of radius 'a' carrying current I, determine Magnetic field everywhere.

Q. 3   (20 Marks)

a)   Explain in brief Maxwell's Equation for Time varying field in Integral and Point format, also give their significance
b)   Magnetic field component of an EM wave propagating through a non-magnetic medium $(\mu = \mu_0)$ is:
$$\bar{H} = 25 \sin(2 \times 10^8 t + 6x)\overline{a_y} \ mA/m$$
Determine:
       • The direction of wave propagation
       • The permittivity
       • Electric Field

Q. 4   (20 Marks)
a)   List boundary conditions for time varying field if given that:
$$\bar{D} = 50\overline{a_x} + 80\overline{a_y} - 30\overline{a_z} \ nC/m^2$$
In region $x \geq 0$ where ε=2.1ε$_0$. Find Electric charge density for region $x \leq 0$ where ε=7.6ε$_0$.
b)   Obtain Poission's and Laplacian's Equation used to solve boundary problems for conducting plates described as V(z=0) = 0V and V(z=2mm) = 50V. Determine:
       • V
       • $\bar{E}$
       • $\bar{D}$

Q. 5 (20 Marks)

a) Lossless 50Ω transmission line terminated by a load impedance $Z_L = 75 + 60j$ Ω, using Smith chart determine:
- Reflection Coefficient
- SWR
- Input Impedance at 0.2λ from load verifying the same using analytical solution

b) Obtain Integral form of Poynting Theorem and Explain significance of each term

Q. 6 Write short note on (20 Marks)

a) Electric Dipole
b) Electrostatic discharge
c) Magnetic Levitation
d) Wave propagation through lossy dielectrics

_____

18F802BF4CB7FB2A6268C20CF5DE4117

(3 Hours) [Total Marks: 80]

N.B: (1) Questions No.1 is compulsory.
(2) Attempt any three questions out of remaining five questions.
(3) Assume suitable data if required.
(4) Figures to the right indicate full marks.

Q.1 Solve any four **20**
a) State the relationship between DTFS, DTFT and DFT.
b) Differentiate FIR and IIR filters.
c) Differentiate fixed point and floating point implementations.
d) A digital filter has the following transfer function. Identify type of filter and justify

$$H(z) = \frac{z}{z+0.5}$$

e) Explain how the speed is improved in calculating DFT by using FFT algorithm.

Q. 2 a) A high pass filter is to be designed with following desired frequency response. **10**
$$H_d(e^{jw}) = 0 \qquad -\frac{\pi}{4} \le w \le \frac{\pi}{4}$$
$$= e^{-j2w} \qquad \frac{\pi}{4} < |w| \le \pi$$

Determine the filter coefficients h(n) if the window function is defined as
$$w(n) = 1 \quad 0 \le n \le 4$$
$$= 0 \quad \text{otherwise}$$

Also determine the frequency response $H(e^{jw})$ of the designed filter.

b) Compute circular convolution of following sequences using DITFFT and **10**
IDITFFT
$$x_1(n) = \{1,2,1,2\} \text{ and } x_2(n) = \{1,2,1\}$$

Q 3 a) Explain design steps for to design FIR filter using frequency sampling method. **10**
b) Explain the mapping from S-plane to Z-plane using impulse invariance technique. **10**
Also explain the limitations of this method.

Q. 4 a) Design a Chebyshev-I filter with maximum passband attenuation of 2.5 dB at **10**
$\Omega p = 20$ rad/sec and stopband attenuation of 30dB at $\Omega s = 50$ rad/sec.
b) Develop composite radix DIFFFT flow graph for N=6=3×2. **10**

Q. 5 a) Design a digital Butterworth filter that satisfies following constraints using bilinear **10**
transformation method. Assume Ts=1s.
$$0.707 \le \left| H(e^{jw}) \right| \le 1 \qquad 0 \le w \le \frac{\pi}{2}$$
$$\left| H(e^{jw}) \right| \le 0.2 \qquad \frac{3\pi}{4} \le w \le \pi$$

b) Explain the effects of finite word length in digital filters with examples. **10**

Q. 6. a) Explain application of DSP processor in ECG signal analysis. **10**
b) Draw neat architecture of TMS320C67XX DSP processor and explain each **10**
block.

****

56548

(3 Hours)   **Max. marks: 80**

N.B.: **(1)**   **Question No. 1 is compulsory.**
      (2)   **Solve any three questions from the remaining five questions.**
      (3)   **Figures to the right indicate full marks.**
      (4)   **Assume suitable data if necessary and mention the same in answer sheet.**

Q.1   Attempt **any 4** questions   [20]

   (a)   List the steps involved in fabrication process of MOSFET.

   (b)   Compare the output resistance of the cascade MOSFET current source to that of the two-transistor current source. Assume $I_{REF} = I_O = 100$ µA in both the circuits, $\lambda = 0.01$ V^{-1} for all transistors, and $g_m = 0.5$ mA/V.

   (c)   Draw a mask layout of NMOS transistor.

   (d)   Derive the equation for output resistance of common gate amplifier.

   (e)   Draw the equivalent model for transformer and explain.

   (f)   List the second order effects in MOSFET. Discuss any one of them.

Q.2   (a)   Why is scaling required? Discuss the various types of scaling.   [10]

   (b)   Consider the MOSFET current source in Fig. 2 (b) with $V^+ = 10$ V and $V^- = 0$, and   [10] the transistor parameters are: $V_{TN} = 1.8$ V, ½ $\mu_n C_{ox} = 20$ µA/V^2, and $\lambda = 0.01$ V^{-1}. The transistor width-to-length ratios are: $(W/L)_2 = 6$, $(W/L)_1 = 12$, $(W/L)_3 = 3$. Determine (i) I_{REF}, (ii) I_O at $V_{DS2} = 2$ V.
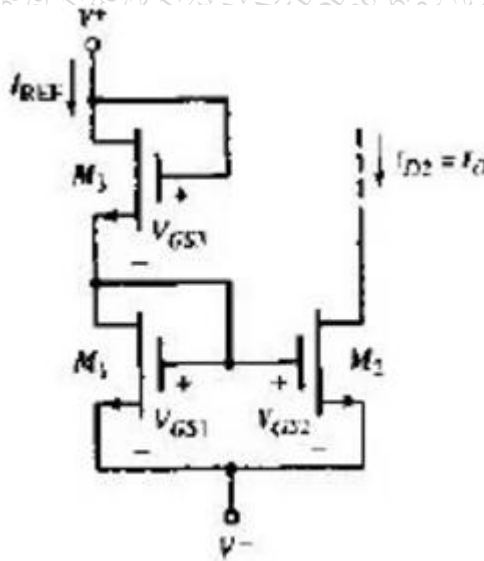

Fig. 2(b)

Q.3   (a)   Consider the differential amplifier shown in Fig. 3(a). The transistor parameters   [10] are: $K_{n1} = K_{n2} = 0.1$ mA/V^2, $K_{n3} = K_{n4} = 0.3$ mA/V^2, and for all transitors, $\lambda = 0$ and $V_{TN} = 1$ V. Determine the maximum range of common-mode input voltage.
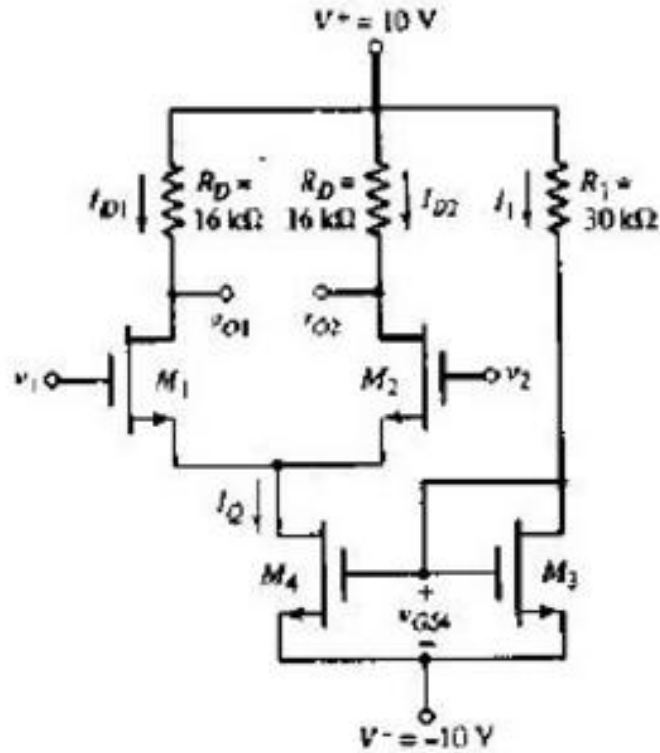
P.T.O

Fig. 3(a)

(b) With a neat circuit explain Bias Independent Current Source using MOSFET. [10]

Q.4 (a) For the circuit shown in Fig. 4(a), let $V_{DD} = V_{SS} = 1.5$ V, $V_{TN} = 0.6$ V, $V_{TP} = -0.6$ V, all channel lengths = 1 μm, $k_n' = 200$ μA/V^2, $k_p' = 80$ μA/V^2, and $\lambda = 0$. For $I_{REF} = 10$ μA, find the widths of all transistors to obtain $I_2 = 60$ μA, $I_3 = 20$ μA, and $I_5 = 80$ μA. It is further required that the voltage at the drain of Q_2 be allowed to go down to within 0.2 V of the negative supply and that the voltage at the drain of Q_5 be allowed to go up to within 0.2 V of the positive supply. [10]
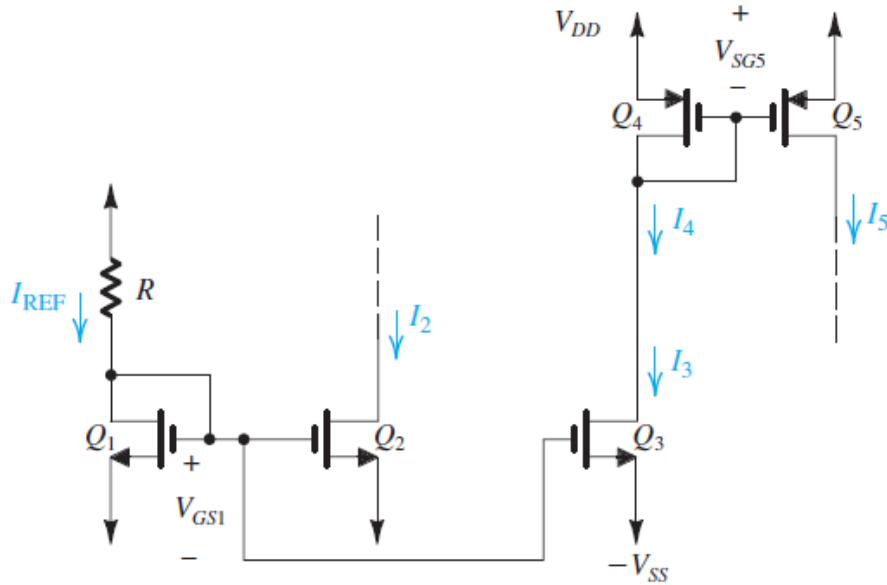

Fig. 4(a)

P.T.O

(b) Draw a small signal equivalent structure of Diff-amp and derive the equation for its CMRR. [10]

Q.5 (a) Draw a neat diagram of Class B power amplifier. Derive equation for its efficiency. [10]

(b) A CS amplifier utilizes an NMOS transistor with $L=0.36$ µm and $W/L=10$; it was fabricated in a 0.18-µm CMOS process for which $\mu_n C_{ox} = 387$ µA/V^2 and $V_A' = 5$ V/µm. Find the values of g_m and A_0 obtained at $I_D = 10$ µA. [10]

Q.6 Short notes on: (**Attempt any four**) [20]
(a) Short channel effects in MOSFET.
(b) Wilson Current Mirror.
(c) MOS device capacitances.
(d) Folded cascode MOS amplifier.
(e) Fabrication of inductors.

****

Time: 3 Hours   **Maximum Marks:80**

Note:
1. Question no. 1 is compulsory.
2. Out of remaining questions, attempt any 3 questions.
3. In all 4 questions to be attempted.
4. All questions carry equal marks.
5. Answer to each new question to be started on a fresh page.
6. Figure in brackets on the right hand side indicate full marks for a question.
7. Illustrate answer with neat diagrams wherever necessary.

Q1. Attempt **any 4** from the following:- [20]

    a) Draw the block diagram of monochrome TV transmitter and explain its working.

    b) What do you understand by compatibility in television system? What are the requirements to be considered to make colour TV system fully compatible for?

    c) Compare PAL and NTSC television systems. (Five significant points of comparison)

    d) What is difference between component video and composite video? Explain.

    e) What is MAC signal? What are its advantages?

Q2   a) Draw and explain Image Orthicon type camera tube in detail. [10]

    b) Explain the concept of frequency interleaving in television system. [10]

Q3   a) With the neat labeled diagram explain the NTSC receiver operation. [10]

    b) What is Chroma subsampling? Explain the concept of Chroma subsampling with its types. [10]

Q4   a) What are different standards for video compression? With the help of neat diagram explain MPEG-2 principle. [10]

    b) Draw and explain satellite television communication system. [10]

Q5   a) Explain IPTV with respect to architecture, internet protocols used, advantages and limitations. [10]

    b) What is CCTV? Draw its block diagram and explain its principle of operation. [10]

Q6   a) Write short note on **any two**: [10]

    i) Chrome cast   ii) Set-Top-Box
    iii) HDTV standards & compatibility   iv) DVB-H standard

    b) Explain the working principle of LED display with diagram and compare LED and LCD type of television displays. [10]

54651

621EAA5DB662327A171E946020E7FA45

(3 hours)   Marks: 80

Note the following instructions.
1. **Question No.1 is compulsory**
2. **Attempt any three questions from remaining five questions**
3. **Solve in total 4 questions**
4. **Assume suitable data wherever necessary, justify the same**
5. **Figures to the right indicate full marks.**

1.a Realize the following symmetric function using full adders and gates. [5]
$f(v,w,x,y,z) = S_{2,4}(v,w,x,y,z)$

1.b What is a Threshold logic element? Give its advantages and limitations [5]

1.c What is incompletely specified machines and how to specify using compatible [5]
states?

1.d How to determine the state table of an unknown machine? [5]

2.a Use the Quine–McCluskey method to generate the set of essential prime implicants [10]
and to obtain the minimal expressions for the following functions.

$T(w,x,y,z) = \sum (0,1,2,3,5,8,10,11,13,15)$

2.b In the following state table, find the equivalence partition and the corresponding [10]
reduced machine in standard form.

	NS, z	
PS	x = 0	x = 1
A	F, 0	B, 1
B	G, 0	A, 1
C	B, 0	C, 1
D	C, 0	B, 1
E	D, 0	A, 1
F	E, 1	F, 1
G	E, 1	G, 1

3.a (i) Give the properties of symmetric function. [10]
(ii) Decomposed the following function and determine the functions F and Φ.

$f(v,w,x,y,z) = \sum (1,2,7,9,10,17,19,26,31) + \sum_\phi (0,15,20,23,25)$
$=F[\Phi(v,w,y),x,z]$

3.b Find all the test vectors that detect faults s-a-0 and s-a-1 for all the input variable [10]
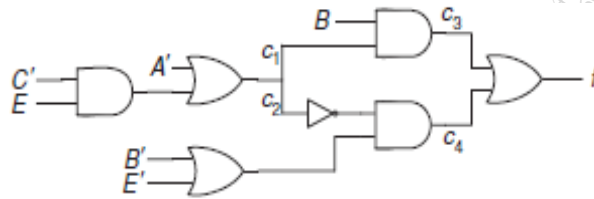wires using the Fault table method.
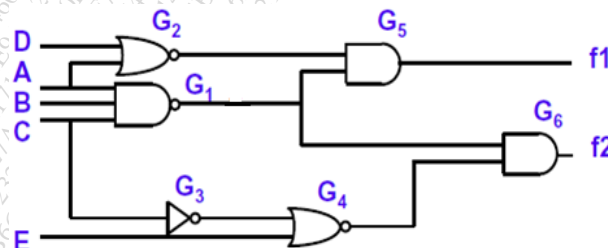
4.a Determine whether the following function is a threshold function, and if it is find a [10]
weight-threshold vector.

$f(v,w,x,y,z) = \sum (4,7,8,11,13,14,23,27,28,29,30)$

4.b   Explan homing and synchronizing sequence techniques   **[10]**

5.a   Find all the test vectors that detect input A's-a-0 by using the Path sensitization   **[10]**
and the Boolean Differences method.

5.b   Explain the lattice of closed partitions of machine.   **[10]**

6. a   Design a one-input one-output synchronous sequential circuit (Mealy Machine)   **[10]**
which produces an output symbol $z = 1$, whenever the "1101"overlap input
sequence occurs.(Use only J-K Flip flops)

6. b   What are the components of ASM chart? Draw an ASM chart and state table for a   **[10]**
2 bit up-down counter with mode control input.

_____

Duration :3hrs   **Max.Marks:80**

N.B.   **(1) Question No. 1 is compulsory.**
       (2)Attempt any three questions out of remaining five.
       (3)Figures to the right indicate full marks.
        (4)Assume suitable data if required and mention the same in answer sheet.

1.   Solve any four   **20**
       (a) Explain test for unique decodability with suitable example
       (b) What are the main features of MPEG-1?
       (c) Explain Chinese Reminder theorem (CRT) with example.
       (d) What are the limitations of JPEG? How to overcome these limitations?
       (e) What are the various models used for data compression?

2.   (a) A Source K= [a, b, c, d] has probabilities [0.7,0.05,0.15,0.1] respectively. Generate tag for the   **10**
       sequence [a c d b a] using Arithmetic coding.
     (b) What is the significance of prime numbers in public key cryptography? Explain RSA algorithm   **10**
       with suitable example.

3.   (a) What do you mean by secure hash algorithm (SHA) explain in detail. What are the characteristics   **10**
       of secure hash algorithm?
     (b) Explain modification detection code (MDC) and message authentication code (MAC) w.r.t.   **10**
       message authentication.

4.   (a) Take an alphabet string and show encoding procedure for LZ78 and LZW. Compare LZ78 and   **10**
       LZW
     (b) Explain update procedure and encoding for the adaptive Huffman coding algorithm with suitable   **10**
       diagram / examples.

5.   (a) Explain Triple DES with Two Keys in detail.   **10**
     (b) Explain Ceaser Cipher and multiplicative cipher with suitable examples and diagrams.   **10**

6.   Write short note on(any four)   **20**
       (a) SSL Architecture
       (b) Intrusion detection system
       (c) PGP
       (d) JPEG LS
       (e) H.261

****