

TE-EXT/V)MPS/CBCGS/15/11/18

(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 8086pp? 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 pp. 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



[Time: Three Hours]

[ Marks:80]

Please check whether you have got the right question paper.

- N.B:
1. Question.No.1 is compulsory.
  2. Answer any three questions out of remaining five.
  3. Assume suitable data wherever necessary.

- Q.1 Attempt any four: 20
- a. Explain function of T0 and T1 pins of 8051.
  - b. Explain PSW of 8051 in detail.
  - c. Explain Memory organization in 8051 microcontroller.
  - d. Explain the concept of pipeline of ARM 7.
  - e. Compare AJMP, SJMP and LJMIP instruction of 8051.
- Q.2 a. Explain interrupts in 8051 microcontroller. 10
- b. Explain PORT 3 structure of 8051. 10
- Q.3 a. Explain interfacing of ADC 0808 with 8051. 10
- b. List and explain the different core extension used with ARM processor. 10
- Q.4 a. Design 8051 based system with following specifications 10
- i) 8051 working at 10MHz.
  - ii) 4 KB External Program memory using 2 KB chips
  - iii) 8 KB External Data memory using 4 KB chips
- b. Explain addressing modes of ARM with examples. 10
- Q.5 a. Explain stack operation in 8051 with examples. 10
- b. Explain IR based wireless communication system. 10
- Q.6 20
- a. Explain current program status registers of ARM7
  - b. Explain serial communication in 8051
  - c. Explain "Digital camera as an embedded system"
  - d. What are the challenges in optimizing embedded system design matrices?



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.



20

4.1 Answer the following (Any Four)

- 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.

- a. The nine symbols viz.  $A_1, A_2, A_3, \dots, A_9$  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

- a. Linear block code having following parity check equations –  
 $c_4 = d_1 + d_2 + d_3$ ,  $c_5 = d_1 + d_2$ ,  $c_6 = d_1 + d_3$ . Calculate G & H matrix, error detection & Correction capacity of the code, decode the received codeword—101100 10
- b. Derive the expression for the probability of error of the matched filter. 10

- 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  $g_1=101$ ,  $g_2=110$ ,  $g_3=011$ . Draw encoder, State table, State diagram & code trellis. Calculate the code word for the message vector 101011. 10

- 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

20

5 Write a short note on (Any Three)

- 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.

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Duration : 3 Hours

Marks : 80

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



- Q1 Attempt any Four ( 20 Marks)
- Calculate charge density due to electric flux density  $\vec{D} = 4r \sin \theta \vec{a}_r + 2r \cos \theta \vec{a}_\theta + 2z^2 \vec{a}_z$  C/m<sup>2</sup>
  - Obtain point format of Continuity equation
  - Express Biot Savart's law in vector format
  - For parallel plates capacitor with plate area  $10\text{cm}^2$  and plates separation  $3\text{mm}$  has voltage of  $100\text{ sin } 10^5 t$  V applied to its plates. Calculate displacement current density ( $\epsilon = 2\epsilon_0$ )
  - Define following terms:
    - Uniform Plane waves
    - TBM wave
  - Define the term Characteristic Impedance, Write expression for the same for Lossy and Lossless lines
  - Show that  $\vec{E} = -\nabla V$

( 20 Marks)

Q. 2

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

( 20 Marks)

Q. 3

- Explain in brief Maxwell's Equation for Time varying field in Integral and Point format, also give their significance
- Magnetic field component of an EM wave propagating through a non-magnetic medium ( $\mu = \mu_0$ ) is:

$$\vec{H} = 25 \sin(2 \times 10^9 t + 6x) \vec{a}_y \text{ mA/m}$$

Determine:

- The direction of wave propagation
- The permittivity
- Electric Field

( 20 Marks)

Q. 4

- List boundary conditions for time varying field if given that:  
 $\vec{D} = 50\vec{a}_x + 80\vec{a}_y - 30\vec{a}_z$  nC/m<sup>2</sup>  
In region  $x \geq 0$  where  $\epsilon = 2$ . In. Find Electric charge density for region  $x \leq 0$  where  $\epsilon = 7.6\epsilon_0$ .
- Obtain Poisson's and Laplacian's Equation used to solve boundary problems for conducting plates described as  $V(x=0) = 0\text{V}$  and  $V(x=2\text{mm}) = 50\text{V}$ . Determine:
  - V
  - $\vec{E}$
  - $\vec{D}$

Q. 5

(20 Marks)

- a) Lossless  $50\Omega$  transmission line terminated by a load impedance  $Z_L = 75 + 60j \Omega$ , using Smith chart determine:
- Reflection Coefficient
  - SWR
  - Input Impedance at  $0.2\lambda$  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

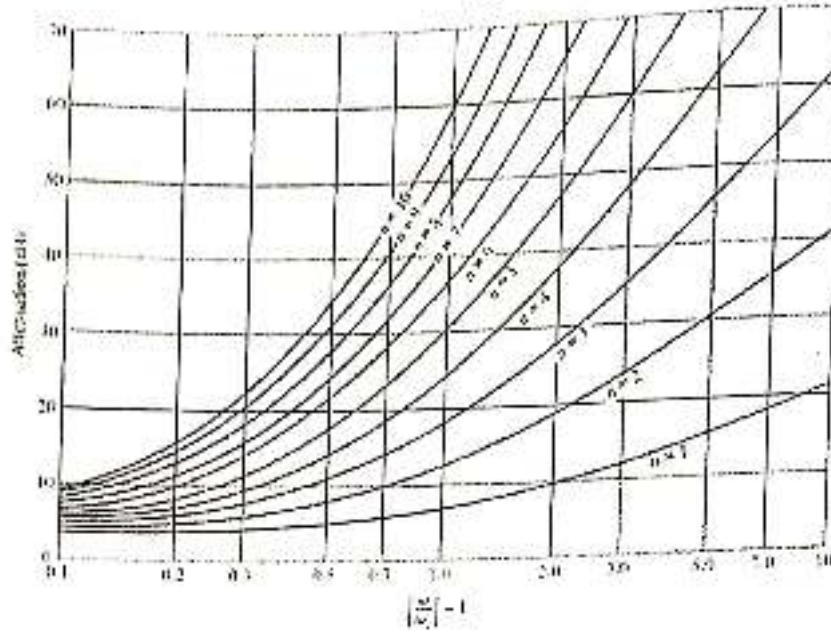


- N.B. : (1) Question No. 1 is compulsory.  
(2) Solve any three questions from the remaining five.  
(3) Figures to the right indicate full marks  
(4) Assume suitable data if necessary and mention the same in answer sheet.

- Q1 (a) Explain the Hazards of Electromagnetic Radiation. 20  
(b) Explain the radiation mechanism of antenna with single wire system.  
(c) Explain the use of Richard transformation and Kurodas Identity in RF filter design  
(d) Derive an expression for array of two isotropic sources with same amplitude and in phase.
- Q2 (a) Explain the RF behavior of resistor, capacitor and inductor. 10  
(b) Discuss the design procedure for filter using image parameter method. 10
- Q3 (a) Design a maximally flat LPF with a cut off frequency of 2 GHz. The generator and load impedance is  $50 \Omega$  with 15 dB insertion loss at 3GHz with discrete LC components. 10  
(b) Derive an expression for array factor of N element linear array, where all elements are equally fed and spaced. Also find the expression for the position of principle maxima, nulls and secondary maxima. 10
- Q4 (a) A radio link has 15 watt transmitter connected to an antenna of  $2.5 \text{ m}^2$  effective aperture at 5 GHz. The receiving antenna has an effective aperture of  $0.5 \text{ m}^2$  and is located at a 15 km line of sight distance from transmitting antenna. Assume lossless antennas. Find power delivered to the receiver. 10  
(b) Derive an expression for E field and H field of infinitesimal dipole antenna 10
- Q5 (a) What is folded dipole Antenna? Draw its typical structure and explain working mechanism. Give its advantages. 10  
(b) What is Dolph- Chebyshev array? Explain the steps involved in design of Dolph-Chebyshev array. 10
- Q6. Write short notes 20  
(a) Ground effects on Antenna  
(b) Log periodic Antenna  
(c) Loop antenna  
(d) Horn antenna

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Attenuation versus normalized frequency for maximally flat filter prototypes.  
 Adapted from G. L. Mathias, L. Young, and E. M. T. Jones, *Electronic Filter, Impedance-Matching Networks and Coupling Structures*, Artech House, Dedham, Mass., 1990, with permission.



Element Values for Maximally Flat Low-Pass Filter Prototypes ( $\omega_c = 1$ ,  $\omega_r = 1$ ,  $N = 1$  to 10)

N	$R_1$	$R_2$	$R_3$	$R_4$	$R_5$	$R_6$	$R_7$	$R_8$	$R_9$	$R_{10}$	$R_{11}$
1	2.0000	1.0000									
2	1.4142	1.4142	1.0000								
3	1.0000	2.0000	1.5000	1.0000							
4	0.7654	1.5478	1.8478	0.7654	2.0000						
5	0.6180	1.6180	2.0000	1.6180	0.6180	1.0000					
6	0.5176	1.4142	1.9318	1.9318	1.4142	0.5176	1.0000				
7	0.4450	1.2470	1.8019	2.0000	1.8019	1.2470	0.4450	1.0000			
8	0.3902	1.1111	1.6629	1.9615	1.9615	1.6629	1.1111	0.3902	1.0000		
9	0.3473	1.0000	1.5121	1.8794	2.0000	1.8794	1.5321	1.0000	0.3473	1.0000	
10	0.3129	0.9080	1.4142	1.7820	1.9754	1.9754	1.7820	1.4142	0.9080	0.3129	1.0000

Source: Reprinted from G. L. Mathias, L. Young, and E. M. T. Jones, *Electronic Filter, Impedance-Matching Networks and Coupling Structures*, Artech House, Dedham, Mass., 1990, with permission.



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 practical diode detector.
  - (b) Define sensitivity, image frequency rejection and fidelity for radio receiver.
  - (c) What is quantization? Explain types of quantization.
  - (d) Why IF is selected as 455 KHz in AM?
  - (e) List the applications of pulse communication.
2. (a) Explain concept of AM Wave with related equations and waveforms. 10
  - (b) Draw the block diagram of phase cancellation SSB generator and explain how carrier and unwanted sidebands are suppressed? 10
3. (a) Explain the operation of Foster seeley discriminator with the help of circuit diagram and phasor diagram. 10
  - (b) Explain the principle and generation of indirect method of FM generation. 10
4. (a) What are the drawbacks of delta modulation? Explain the method to overcome these drawbacks. 10
  - (b) With the help of suitable waveforms explain generation and detection of PPM. 10
5. (a) Explain Super heterodyne radio receiver in detail with block diagram. 10
  - (b) Explain VSB Transmission in detail with its application. 10
6. Write short note on (any four) 20
  - (a) Compare FM and PM
  - (b) FM noise triangle
  - (c) Noise figure and noise factor
  - (d) Frequency division Multiplexing (FDM)
  - (e) Pre emphasis and de-emphasis circuits

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(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

- 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

$$H_d(e^{jw}) = \begin{cases} 0 & -\frac{\pi}{4} \leq w \leq \frac{\pi}{4} \\ e^{-j2w} & \frac{\pi}{4} < |w| \leq \pi \end{cases}$$

Determine the filter coefficients  $h(n)$  if the window function is defined as

$$w(n) = \begin{cases} 1 & 0 \leq n \leq 4 \\ 0 & \text{otherwise} \end{cases}$$

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

- b) Compute circular convolution of following sequences using DITFFT and IDITFFT 10

$$x_1(n) = \{1, 2, 1, 2\} \text{ and } x_2(n) = \{1, 2, 1\}$$

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  $\Omega_p = 20$  rad/sec and stopband attenuation of 30dB at  $\Omega_s = 50$  rad/sec. 10

- b) Develop composite radix DITFFT flow graph for  $N=6=3 \times 2$ . 10

Q.5 a) Design a digital Butterworth filter that satisfies following constraints using bilinear transformation method. Assume  $T_s = 1s$ . 10

$$0.707 \leq |H(e^{jw})| \leq 1 \quad 0 \leq w \leq \frac{\pi}{2}$$

$$|H(e^{jw})| \leq 0.2 \quad \frac{3\pi}{4} \leq w \leq \pi$$

- 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 block. 10

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(3 Hours)

[Total Marks: 80]

- N.B.: (1) Question No. 1 is compulsory.  
 (2) Solve any three questions from the remaining five.  
 (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:
- (A) Draw a neat circuit of half wave precision rectifier. Draw its input and output waveforms. [05]  
 (B) Draw a neat circuit with all the component values of mono-stable multivibrator for timer application using IC 555 to obtain a pulse width of 1.1 ms. Take timing capacitor of value 1  $\mu$ f. [05]  
 (C) Draw a neat circuit of Current to Voltage converter. Give its output expression. [05]  
 (D) Draw the functional block diagram of IC 723. [05]  
 (E) Draw the internal structure of IC 7490 decade counter. Draw its timing diagram. [05]
- Q.2 (A) Draw a neat circuit diagram of RC phase shift oscillator using op-amp. Derive its frequency of oscillation. What are the values of R and C if its frequency of oscillation is 1 kHz? [10]  
 (B) Draw a mod-10 counter using IC 7493. Draw its timing diagram. [10]
- Q.3 (A) With the help of a neat diagram and voltage transfer characteristics explain the working of inverting Schmitt trigger. Derive the expressions for its threshold levels. [10]  
 (B) Design a voltage regulator using IC 723 to give  $V_o = 4$  V to 32 V and output current of 2 A. [10]
- Q.4 (A) Draw the circuit diagram of a square and triangular waveform generator using op-amps and explain its working with the help of waveforms. For variation in duty cycle what is the modification needed in the circuit. [10]  
 (B) Design a second order Butterworth high pass filter for cut off frequency of 1 kHz and pass-band gain of AF=2. [10]
- Q.5 (A) What is an instrumentation amplifier? Draw a neat circuit of an instrumentation amplifier using 3 op-amps. Derive its output voltage equation. [10]  
 (B) With the help of a functional block diagram explain the working of voltage regulator LM317 to give an output voltage variable from 5 V to 10 V to handle maximum load current of 500 mA. [10]
- Q.6 Write short notes on: (Attempt any two)
- (A) Various parameters of op-amp. [10]  
 (B) IC 74181 Arithmetic Logic Unit. [10]  
 (C) Power amplifier LM380. [10]

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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
- (a) Explain test for unique decodability with suitable example
  - (b) What are the main features of MPEG-1?
  - (c) Explain Chinese Remainder 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 sequence  $[a c d b a]$  using Arithmetic coding. 10  
(b) What is the significance of prime numbers in public key cryptography? Explain RSA algorithm with suitable example. 10
3. (a) What do you mean by secure hash algorithm (SHA) explain in detail. What are the characteristics of secure hash algorithm? 10  
(b) Explain modification detection code (MDC) and message authentication code (MAC) w.r.t. message authentication. 10
4. (a) Take an alphabet string and show encoding procedure for LZ78 and LZW. Compare LZ78 and LZW 10  
(b) Explain update procedure and encoding for the adaptive Huffman coding algorithm with suitable diagram / examples. 10
5. (a) Explain Triple DES with Two Keys in detail. 10  
(b) Explain Caesar 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



EXTC / semiv / PCBCLRS / PGE/14/12/18

Paper / Subject Code: 40805 / Principles of Communication Engineering

Q.P.Code: 39182

(3 Hours)

- N.B. (1) Question No. 1 is compulsory. Total Marks : 80  
(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) Modulation Index for AM should be less than one. Justify/Contradict.
  - (b) What is aliasing? How it can be prevented?
  - (c) Why AGC is required in radio receivers?
  - (d) Justify, why FM is more immune to noise?
  - (e) Define noise figure and noise factor.
2. (a) State and prove sampling theorem for low pass bandlimited signals. 10  
(b) One input to AM modulation is 800 KHz carries with an amplitude of 10 10  
Vp. The second input is 10KHz modulating signal that is of sufficient amplitude  
to cause a change in o/p wave of = 5.5Vp. Determine.
- i) Upper and lower side frequency
  - ii) Modulation co-efficient and percent modulation
  - iv) Draw o/p frequency spectrum
  - v) Draw modulated wave showing maxima and minima of waveforms
3. (a) Explain the operation of Foster seeley discriminator with the help of circuit 10  
diagram and phasor diagram.  
(b) Explain the working of stabilized reactance modulator with suitable diagram. 10
4. (a) With help of neat diagram and waveforms explain generation and 10  
demodulation of PWM  
(b) Explain phase shift method for suppression of unwanted carrier with neat 10  
block diagram.



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5. (a) Explain the following with reference to AM receiver 10  
(i) Double spotting  
(ii) Three point tracking  
(iii) Image frequency rejection ratio  
(iv) Fidelity
- (b) Explain Indirect FM transmitter with suitable diagram. 10
6. Write short note on (any four) 20  
(a) Vestigial side band transmission (VSB) and its application.  
(b)  $\mu$ -law and A-law companding  
(c) Frequency division Multiplexing (FDM)  
(d) Amplitude limiting and thresholding  
(e) Pre emphasis and de-emphasis circuits and its need

