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**8404**

Printed Pages : 3

**BT-4 / M-16**

**ELECTRONICS INSTRUMENTATION AND  
MEASUREMENTS**

**Paper-ECE-202 E**

*Time allowed : 3 hours]*

*[Maximum marks : 100*

*Note : Attempt five questions in all, selecting at least one question from each unit. Assume any missing data. All questions carry equal marks.*

**Unit-I**

1. (a) Draw and describe functional block diagram of generalized measuring system. 8  
(b) Describe the working of a Wheatstone bridge. Determine the accuracy of Wheatstone bridge that uses precision resistors with an accuracy of  $\pm 0.035\%$  and adjustable precision resistor that has an accuracy of  $\pm 0.05\%$ . 6+6
  
2. (a) A 0-10A ammeter has a guaranteed accuracy of 1.5% of full scale reading. The current measured by the ammeter is 2.5A. Calculate the limiting value of current and the % age limiting error. 8  
(b) Write the note on Carey Foster Bridge and Measurement of insulation Resistance. 6+6

**Unit-II**

3. (a) Describe the purpose, principle of operation, balance conditions, phasor diagram and advantage and disadvantages of Schering bridge. Derive the equation

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for capacitance and dissipation factor. List the applications of Wein and Schering bridges. 10+2

(b) Derive the equation of balance for an Anderson's bridge. Draw the phasor diagram for conditions under balance. 8

4. (a) Describe the basic components of magnetic tape recorder using direct recording technique and explain how equalization is carried out in magnetic tape recorder using this technique. Compare direct and F.M. methods of magnetic tape recording. 5+6+4

(b) Write note on Maxwell induction Capacitance Bridge.5

### Unit-III

5. (a) Explain with help of block diagram the working of the frequency-selective and heterodyne wave analysers. List the advantages /disadvantages of each over other. 12

(b) Explain the working of digital frequency meter for the measurement of Frequency, pulse width and time interval. 8

6. (a) Explain with help of circuit diagram the working of Q-meter. Describe the procedure for Q measurement of coil from Q-meter. 10

(b) Explain the advantages of digital indicating instruments over their analog counterparts. Also explain in brief the working of different digital display devices. 4+6

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**Unit-IV**

7. (a) What are Transducers ? In case of resistance strain gauge under the influence of stress, bring out the relationship between the resistance and the various parametres. Illustrate the advantages of foil gauges over resistance gauges. What is the function of dummy strain guages ?  
10
- (b) Explain the construction, working principle, advantages and disadvantages of L.V.D.T. Why the frequency of excitation of primary kept very high as compared to the frequency of the signal being detected. 8+2
8. (a) Explain one capacitive and one Inductive methods for liquid-level measurements. 5
- (b) Explain the block diagram of a general Telemetry system. Define the terms; noise, and bandwidth restriction in telemetry system. 4+3
- (c) Explain dual-slope integration type ADC along with its wave forms. An ADC converter has 20 ms integration time. What is the normal mode rejection offered by this ADC for signals having frequency of (i) 145 Hz and (ii) 150 Hz. 5+3

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**BT-4 / M-16**  
**DIGITAL ELECTRONICS (NEW)**  
**Paper-ECE-204 E**

*Time allowed : 3 hours]*

*[Maximum marks : 100*

*Note : Attempt five questions. At least one question from each part.*

**Part-A**

1. (a) Simplify the following function using K-map technique  
 $f(A, B, C, D) = \pi(0, 3, 4, 7, 8, 10, 12, 14) + d(2, 6)$  10
- (b) List out the basic rules that are used in Boolean algebra expression with examples. 10
2. Simplify the following Boolean function by using Quine McClusky (Q-M) method.  
 $F(A, B, C, D) = \sum(0, 2, 3, 6, 7, 8, 10, 12, 13)$  20

**Part-B**

3. (a) Design a full adder and a full subtractor. 10
- (b) Realize  $F(W, X, Y, Z) = \sum(1, 4, 6, 7, 8, 9, 10, 11, 15)$  using 8 to 1 Mux 10
4. (a) How will you convert a D-flip flop into J K flipflop ? 10
- (b) Discuss Johnson Counter in detail. 10

**Part-C**

5. (a) Explain working of CMOS logic gates. 10
- (b) Explain the working of a basic totempole TTL 2 input NAND gate. 10

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6. (a) Explain the terms
- |               |                        |    |
|---------------|------------------------|----|
| (i) fan-in    | (ii) Tri-state gate    |    |
| (iii) fan-out | (iv) Propagation delay | 10 |
- (b) Write short note on RTL and ECL. 10

**Part-D**

7. Implement the following Boolean functions with a PLA
- $$F_1(A, B, C) = \sum (0, 1, 2, 4)$$
- $$F_2(A, B, C) = \sum (0, 5, 6, 7)$$
- $$F_3(A, B, C) = \sum (0, 3, 5, 7) \quad 20$$
8. (a) Write short note on
- |          |            |    |
|----------|------------|----|
| (i) FPGA | (ii) CPLDS | 12 |
|----------|------------|----|
- (b) Discuss R-2R ladder digital to analog converter. 8

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**BT-4 / M-16**  
**FIELDS AND WAVES**  
**Paper-ECE-206 E**

*Time allowed : 3 hours]*

*[Maximum marks : 100*

*Note : Attempt any five questions.*

**Unit-I**

1. (a) A sphere of radius  $R$  is uniformly charged with a surface charge density  $\sigma_0$ . Find out the electric potential and electric field on a point at a distance  $r$  from the centre, when (i)  $r > R$  and (ii)  $r < R$ . (10)
- (b) State and prove the uniqueness theorem. (10)
2. (a) Describe the Poisson's and Laplace's equations and explain their applications. (10)
- (b) A spherical capacitor with radii  $a = 1.5\text{cm}$ ,  $b = 4\text{cm}$  has an in homogeneous dielectric  $\epsilon = 10 \epsilon_0/r$ , where  $r$  is the radial distance. Calculate the capacitance of the capacitor. (10)

**Unit-II**

3. (a) State and explain Biot-Savart law. Can it be proven experimentally? Justify your answer. (10)
- (b) Derive the expression for the magnetic field about two long straight parallel wires, separated by a distance  $d$ , carrying equal and oppositely directed current of  $I$  amp. The distances of the observation point from the two wires are  $r_1$  and  $r_2$ . (10)
4. (a) Describe the Maxwell's equations in point and integral forms. Also give their word statements. (10)

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- (b) By using Maxwell's equations, obtain the boundary conditions for electric and magnetic fields at any surface of discontinuity. (10)

### Unit-III

5. (a) Derive the wave equation in a perfect dielectric containing no charges and no conduction currents. (10)
- (b) What do you understand by polarization of a uniform plane wave? Describe the conditions for circular and elliptical polarizations. (10)
6. (a) What is meant by skin depth? Obtain an expression for the same. (10)
- (b) State and prove the Poynting's theorem. (10)

### Unit-IV

7. (a) Define voltage standing wave ratio (VSWR). Obtain the expressions for maximum and minimum impedances along a lossless transmission line. (10)
- (b) A lossless transmission line having a  $Z_0$  of  $50\Omega$  is connected to a  $30\Omega$  load. Find (i) the reflection coefficient (ii) standing wave ratio (iii) impedance at  $\lambda/4$  from the load. (10)
8. (a) Explain the meaning of the terms : group velocity and phase velocity. (8)
- (b) An air filled waveguide whose inner dimensions are  $3.0 \text{ in.} \times 1.5 \text{ in.}$  has a guide wavelength of  $0.2 \text{ m}$  as determined by slotted line measurements. Find the frequency, phase velocity and group velocity. (12)

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**8411**

Printed Pages : 3

**BT-4 / M-16**

**SIGNAL AND SYSTEMS**

**Paper-EE-208 E Opt- (I)**

*Time allowed : 3 hours*

*[Maximum marks : 100*

*Note : Attempt five questions in all, selecting one question from each unit.*

**Unit-I**

1. (a) What do you mean by analog and discrete signals ?  
Explain with examples. 5
- (b) Differentiate between Fourier series and Fourier transform. 5
- (c) Consider a causal LTI system with frequency response  $H(j\omega) = \frac{1}{j\omega + 3}$ . Determine  $x(t)$  if the system produces output  $y(t) = e^{-3t}u(t) - e^{-4t}(t)$ . 10
  
2. (a) Determine whether or not  $x[n] = \sin\left(\frac{6\pi}{7}n + 1\right)$  is periodic. If this signal is periodic, determine its fundamental period. 10
- (b) State and prove properties of the unilateral Laplace transform. 10

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### Unit-II

3. (a) Explain the concept of moments generating function. 10  
(b) Define and prove sampling theorem at transmitter and receiver. 10
4. (a) Write a note on the relationship between Fourier transform and Z transform. 10  
(b) How analog signals are recovered from sampled signal? 10

### Unit-III

5. (a) Determine whether or not system  $y(t) = a^2 x(t)$  is linear or not. 10  
(b) Write a detailed note on SISO and MIMO. 10
6. (a) Determine whether or not system  $y(t) = x^2(t-3)$  is time invariant or not. 10  
(b) Write a detailed note on SIMO and MISO. 10

### Unit-IV

7. (a) Find the response of the system which is modeled by the following differential equation :

$$\frac{d^3}{dt^3} y(t) + 4 \frac{d^2}{dt^2} y(t) + 5 \frac{d}{dt} y(t) + 2 y(t) = x(t)$$

where  $x(t) = u(t)$ .

10

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(3)

- (b) The input  $x[n]$  and the impulse response  $h[n]$  of a discrete time LTI system are given by :

$$x[n] = 2^n u[-n]$$

$$h[n] = u[n]$$

Compute and plot output.

10

8. (a) Explain the concept of state variables with examples. 10

- (b) Find the system impulse response which is described by the difference equation :

$$y[n-1] + 2y[n] = x[n-2] + x[n-1] + 2x[n]. \quad 10$$

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**BT-4 / M-16**  
**MICROPROCESSORS AND INTERFACING**  
**Paper-ECE-216-E**

*Time allowed : 3 hours]*

*[Maximum marks : 100*

*Note : Attempt five questions in all, selecting at least one question from each section.*

**Section-I**

1. (a) With neat block diagram explain the architecture of 8085. (10)
- (b) Write an assembly language program to add two 2-digits BCD Number. (5)
- (c) Draw and explain the timing diagram of memory write cycle with example. (5)
2. (a) Draw the relevant pin diagram for 8085 Microprocessor and explain function of each pin in detail. (12)
- (b) List the four categories of 8085 instructions that manipulate data. (4)
- (c) Specify the number of registers and memory cells in a  $128 \times 4$  memory chip. (4)

**Section-II**

3. (a) Draw the functional block diagram of 8086 microprocessor and also explain the bit pattern of PSW. (12)
- (b) Explain the concept of Physical address generation in 8086 microprocessor. (8)

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4. (a) Draw and explain the timing diagram for RD operation from an I/O device in Maximum Mode of 8086. (12)
- (b) Generate the code using appropriate template for the following instructions : (8)
- (i) MOV BYTE PTR [SI + 86H], 25H
- (ii) MOV DX, [BP]

### Section-III

5. (a) Explain the operation of 8255 PPI chip with its internal block schematic. Explain its mode 0, mode 1 and BSR modes. (10)
- (b) Interface an 8×8 keyboard using two 8255 ports and draw a flow chart and also write a program to read the code of a pressed key. (10)
6. (a) Interface 8-bit ADC with 8085 using 8255 ports. Configure port A of 8255 for transferring output of ADC to the CPU and port C for control signals. Assume that an analog input is present at I/P6 of the ADC and a clock input of suitable frequency is available for ADC. Draw the schematic and write the required assembly language program. (15)
- (b) Write an ALP to generate square wave using 8255. (5)

### Section-IV

7. (a) What is meant by priority interrupts ? Explain the operation of different interrupts available in 8085, with the help of circuit diagram. How is the device priority determined in hardware polling ? Explain. (10)

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- (b) With the help of a block diagram explain the functioning of Intel 8259 chip. (10)
- 8. (a) Explain with block diagram the 8253 timer chip and its operation. (10)
- (b) Explain the features and operation of DMA controller 8237 with a block schematic. (10)

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8609

CONTROL SYSTEM ENGINEERING  
ECE-302-E (Opt. II)

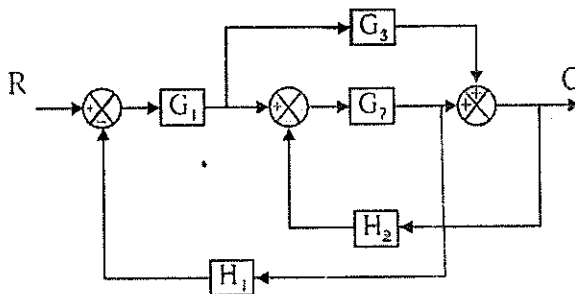
Time : Three Hours]

[Maximum Marks : 100

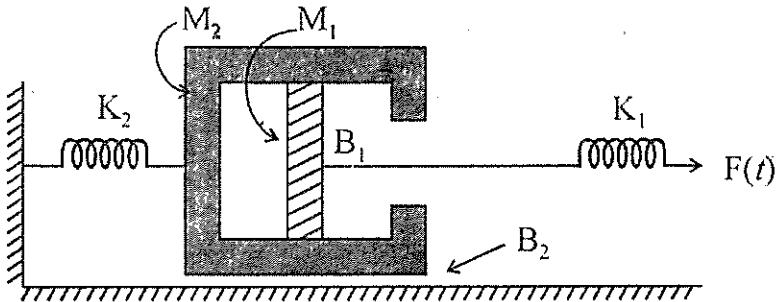
Note : Attempt *Five* questions in all, selecting at least *one* question from each Section.

Section I

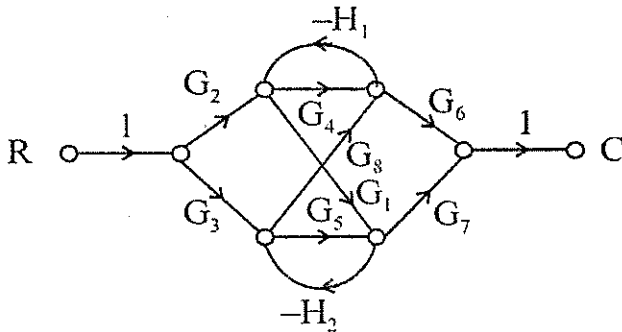
1. (a) Obtain the overall transfer function for the block diagram given below by using block diagram reduction techniques. 10



- (b) Draw the electrical analogous circuit, use f-v and f-i analogy ? 10



2. (a) For the signal flow graph shown below of a system obtain the overall transfer function ? 10



- (b) How the system dynamics can be controlled by using Feedback ? Explain with necessary expressions. 10

## Section II

3. (a) A unity feedback control system has  $G(s) = \frac{1}{s(s+2)}$ .

The input to the system is given by  $r(t) = 2 + 3t + 2t^3$ . Determine Generalized Error Coefficient and Steady State Error. 10

- (b) The closed loop transfer function of a generator voltage regulator feedback control system is given

by  $\frac{E_t}{E_r} = \frac{G}{1+GH}$ . The forward path gain  $G = 200$

and feedback factor  $H = 0.1$ , then calculate : 10

- (i) The reference voltage  $E_r$  for maintaining  $E_0 = 250$  ?

- (ii) The percentage change in generator terminal voltage if the forward path gain is reduced by 10% ?

Determine the results (i) and (ii) if the system is made open loop ?

4. (a) For the following characteristic equation, find the number of roots which lie in the right half and left half of  $s$ -plane :

$$s^6 + s^5 + 5s^4 + 3s^3 + 2s^2 - 4s - 8 = 0$$

using Routh array and comment on the stability of the system ?

10

- (b) Sketch the root locus from the open loop transfer function given below and determine the stability ? 10

$$G(s)H(s) = \frac{K(s+0.1)}{s(s-0.2)(s^2+s+0.6)}$$

### Section III

5. (a) Explain Nyquist's criterion in detail with necessary expressions, explain the condition for stability of a closed loop system using open loop transfer function. 10
- (b) The open loop transfer function of a unity feedback control system is given as :

$$G(s)H(s) = \frac{K(s-2)}{(s+1)^2}$$

Apply Nyquist Plot method to examine the closed loop stability. 10

6. (a) The open loop transfer function of a unity feedback system is given by :

$$G(s) = \frac{K(s+4.9)}{s(s+1)(s+2)}$$

Draw the Bode Plot for the system and determine the value of 'K' for the system to have a phase margin of  $30^\circ$ . 10

- (b) The open loop transfer function of a unity feedback system is given by :

$$G(s)H(s) = \frac{K(s+1)}{s(1+0.2s)(1+0.5s)}$$

Sketch the Polar Plot for the system. 10

#### Section IV

7. Consider a unity feedback uncompensated system with the open loop transfer function as : 20

$$G(s) = \frac{K}{s(0.3s+1)(0.5+1)}$$

Design a Phase-Lag compensator for the system such that the compensated system has static velocity error constant  $K_v = 10 \text{ sec}^{-1}$  and phase margin  $\geq 30^\circ$ .

8. (a) Explain Controllability and Observability of a system in detail. 6  
 (b) Find the state equation and output equation for the system given by : 7

$$\frac{1}{s^3 + 4s^2 + 3s + 3}$$

- (c) Derive solution for Homogeneous type state equation for continuous time systems. 7

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**BT-6/M-16**

**8610**

**VHDL AND DIGITAL DESIGN**

**ECE-304-E**

Time : Three Hours]

[Maximum Marks : 100

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

**Unit I**

1. (a) Explain the architecture of FPGAs. 10  
(b) Explain the different design levels using VHDL. 10
2. (a) Design Full adder circuit using PAL. 10  
(b) Explain the capabilities of VHDL. 10

**Unit II**

3. (a) Write a VHDL code for a 9-bit parity generator circuit. 10  
(b) Explain Inertial and Transport Delays. 10

4. (a) Describe Multiple Drivers with suitable examples. 10  
(b) Write a VHDL code for 1 : 8 Demultiplexer using case statement. 10

### Unit III

5. (a) Explain Generics with suitable examples. 10  
(b) Write a VHDL code to find largest of three integers using functions in entity. 10
6. (a) Explain block configuration with suitable examples. 10  
(b) Describe package declaration and package body. 10

### Unit IV

7. (a) Write a VHDL code for 4-bit counter using generate statement. 10  
(b) Write a short note on VHDL synthesis. 10
8. (a) Describe type conversion with examples. 10  
(b) Describe attributes in detail. 10

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8611

DIGITAL SIGNAL PROCESSING

ECE-306-E (Opt.-I)

Time : Three Hours]

[Maximum Marks : 100

Note : Attempt *Five* questions in all, selecting at least *one* question from each Section. All questions carry equal marks.

Section I

1. (a) Determine the  $z$ -transform and the ROC of the signals :

(i)  $x(n) = [3(2^n) - 4(3^n)] \cup (n)$  5

(ii)  $x(n) = (\cos \omega_0 n) \cup (n)$  5

(b) A linear time-invariant system is characterized by the system function :

$$H(z) = \frac{3 - 4z^{-1}}{1 - 3.5z^{-1} + 1.5z^{-2}}$$

Specify the ROC of  $H(z)$  and determine  $h(n)$  for the following conditions : 10

- (i) The system is stable
- (ii) The system is causal
- (iii) The system is anti-causal.
2. (a) Compute the circular convolution of the sequences :
- (i)  $x_1(n) = \{1, 2, 3, 1\}$   
 $\uparrow$
- (ii)  $x_2(n) = \{4, 3, 2, 2\}$  10  
 $\uparrow$
- (b) Compute the 8-point DFT of the sequence :

$$x(n) = \left\{ \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, 0, 0, 0, 0 \right\}$$

using radix-2 decimation-in-time FFT algorithm.

10

## Section II

3. (a) Determine the cascade and parallel realizations for the system described by the system function : 10

$$H(z) = \frac{10 \left(1 - \frac{1}{2}z^{-1}\right) \left(1 - \frac{2}{3}z^{-1}\right) (1 + 2z^{-1})}{\left(1 - \frac{3}{4}z^{-1}\right) \left(1 - \frac{1}{8}z^{-1}\right) \left[1 - \left(\frac{1}{2} + j\frac{1}{2}\right)z^{-1}\right] \left[1 - \left(\frac{1}{2} - j\frac{1}{2}\right)z^{-1}\right]}$$

- (b) Realize the following IIR filter using ladder structure : 10

$$H(z) = \frac{5z^3 + 3z^2 + 4z + 2}{z(2z^2 + 3z + 1)}$$

4. (a) Determine the parameters ( $k_m$ ) of the lattice filter corresponding to the FIR filter described by the system function : 5

$$H(z) = A_1(z) = 1 + 2z^{-1} + z^{-2}.$$

- (b) Consider a causal IIR filter with system function : 15

$$H(z) = \frac{1 + 2z^{-1} + 3z^{-2} + 2z^{-3}}{1 + 0.9z^{-1} - 0.8z^{-2} + 0.5z^{-3}}$$

### Section III

5. Design an FIR linear-phase digital filter approximating the ideal frequency response : 20

$$H_d(\omega) = \begin{cases} 1, & \text{for } |\omega| \leq \frac{\pi}{6} \\ 0, & \text{for } \frac{\pi}{6} < |\omega| \leq \pi \end{cases}$$

Also :

- (a) Determine the co-efficients of a 25-lap filters based on the window method with a rectangular window.
  - (b) Repeat part (a) with Hamming window.
6. (a) Describe the Gibb's phenomenon. 5
- (b) Explain the design of FIR filters using frequency sampling method. 15

#### Section IV

7. (a) Design a single-pole low pass digital filter with a 3-dB bandwidth of  $0.2\pi$  using the bilinear transformation applied to the analog filter :

$$H(s) = \frac{\Omega_c}{S + \Omega_c}$$

where  $\Omega_c$  is the 3-dB bandwidth of the analog filter. 5

- (b) An IIR digital low-pass filter is required to meet the following specifications :

Passband ripple (or peak-to-peak ripple) :  $\leq 0.5$  dB

Passband edge : 1.2 kHz

Stopband attenuation :  $\geq 40$  dB

Stopband edge : 2.0 kHz

Sample rate : 8.0 kHz

Find out the filter order for Butterworth filter. Use bilinear transformation to convert the analog filter into digital filter. 15

8. (a) Derive an expression to determine the order of the low pass Chebyshev filter. 10
- (b) Describe the frequency transformations in the analog domain. 10

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**8612**

**DIGITAL COMMUNICATION**

**ECE-308-E**

Time : Three Hours]

{Maximum Marks : 100

**Note :** There is total eight questions. All questions carry equal marks. Attempt *Five* questions in all, selecting at least *one* question from each Unit.

**Unit I**

1. (a) What is Sampling Process ? How is this process implemented in communication system ? **10**
- (b) How will you obtain pulse amplitude modulation ? Explain with the proper circuit diagram and respective waveforms. **10**
  
2. (a) What is quantisation noise ? How will you minimize it ? **6**
- (b) Describe the following :
  - (i) Delta Modulator
  - (ii)  $\mu$ -law and A-law compressors. **7×2=14**

## Unit II

3. (a) Why is intersymbol interference generated ? Explain giving mathematical analysis. 10
- (b) Derive the mathematical expression for probability of error of matched filter. 10
4. Discuss the following in detail :
- (i) Tapped delay line equalization 10
- (ii) Nyquist criteria for distortionless baseband binary transmission. 10

## Unit III

5. (a) Discuss the gram schmidt orthogonalization procedure. 10
- (b) What do you mean by coherent binary FSK ? Discuss their generation and detection techniques. 10
6. Explain the following :
- (i) QASK 10
- (ii) MSK. 10

## Unit IV

7. (a) What is frequency hopped spread spectrum ? Give its block diagram and explain the function of each block. 10

(b) A pseudo-noise (PN) sequence is generated using a feedback shift register of length  $m = 4$ , the chip rate is  $10^7$  chips per second, find the following parameters : 10

- (i) PN sequence lengths
- (ii) Chip duration of the PN sequence
- (iii) PN sequence period.

8. Discuss in detail the following :

- (i) CDM 10
- (ii) Frequency hopped spread spectrum. 10

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**8613**

**COMPUTER COMMUNICATION  
NETWORKS  
ECE-310-E**

Time : Three Hours]

[Maximum Marks : 100

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Section.

**Section I**

1. (a) What are the components of data communication system ? Explain in brief. 10
- (b) With a neat diagram, explain the interaction between layers in the OSI model. 10
  
2. (a) What are the layers in TCP/IP model ? Explain responsibilities of each layer ? 10
- (b) Explain the functions and responsibilities of each layer of the OSI reference model. 10

## Section II

3. (a) When bit stuffing is used, is it possible for the loss, insertion, or modification of a single bit to cause an error not detected by the checksum ? If not, why ? If so, how ? Does the checksum length play a role here ? 10
- (b) Explain Frequency hopping spread spectrum (FHSS) in detail. 10
4. (a) PPP is based closely on HDLC, which uses bit stuffing to prevent accidental flag bytes within the payload from causing confusion. Give at least one reason why PPP uses byte stuffing instead ? 10
- (b) Imagine a sliding window protocol using so many bits for sequence numbers that wraparound never occurs. What relations must hold among the four window edges and the window size, which is constant and the same for both the sender and the receiver ? 10

## Section III

5. (a) Describe the sequence of events that take place when two stations simultaneously start transmission in CSMA/CD ? 10

- (b) Compare stop and wait and Go-back-N protocols. Which is more efficient and why ? 10
6. (a) A large number of consecutive IP address are available starting at 198.16.0.0. Suppose that four organizations, A, B, C and D, request 4000, 2000, 4000 and 8000 addresses, respectively, and in that order. For each of these, give the first IP address assigned, the last IP address assigned, and the mask in the  $w.x.y.z/s$  notation. 10
- (b) Convert the IP address whose hexadecimal representation is C22F1582 to dotted decimal notation. 5
- (c) Give *three* examples of protocol parameters that might be negotiated when a connection is set up. 5

#### Section IV

7. (a) Why does UDP exist ? Would it not have been enough to just let user processes send raw IP packets ? 10
- (b) A TCP machine is sending full windows of 65,535 bytes over a 1-Gbps channel that has a 10-msec one-way delay. What is the maximum throughput achievable ? What is the line efficiency ? 10

8. Explain the following briefly :

- |             |   |
|-------------|---|
| (a) E-Mail  | 5 |
| (b) ISDN    | 5 |
| (c) CSMA/CD | 5 |
| (d) IPv4.   | 5 |

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**BT-8/M-16**

**8810**

**WIRELESS AND MOBILE  
COMMUNICATION  
ECE-402-E**

Time : Three Hours]

[Maximum Marks : 100

Note : Attempt *Five* questions in all, selecting at least *one* question from each Section.

**Section I**

1. (a) Discuss role of fading. Distinguish between flat fading and frequency selective fading. **10**
- (b) Explain, how the diffraction affects the signal propagation using knife edge diffraction model ? **10**
2. (a) What are three most important effects of small-scale multipath propagation ? What is fading and Doppler spread ? Discuss the types of services, requirements, spectrum limitations and noise considerations of wireless communications. **10**
- (b) Explain the principle of Cellular Networks and various types of Handoff techniques. **10**

## Section II

3. (a) Illustrate frequency hopping spread spectrum and direct sequence spread spectrum with examples. 10
- (b) Discuss with the help of proper diagram the diversity technique and RAKE demodulation. 10
4. (a) What is digital modulation technique and explain in detail the factors that influence the choice for the same. 10
- (b) What is Brewster angle ? Calculate the Brewster angle for a wave impinging on ground having a permittivity of  $\epsilon_r = 4$ . 10

## Section III

5. (a) Explain the various capacity expansion techniques in cellular systems. 10
- (b) An Urban area has a population of two million residents. Three competing trunked mobile networks (Systems A, B and C) provide cellular service in this area. System A has 394 cells with 19 channels each, system B has 98 cells with 57 channel each, system C has 49 cells, each with 100 channels. Find the number of users that can be supported at

2% blocking if each user averages two calls per hour at an average call duration of 3 minutes. Assuming that all trunked systems are operated at maximum capacity, compute the percentage market penetration of each cellular provider. Given from Erlang B chart for GOS = 2%. 10

No. of Channel :	19	57	100
Total Traffic :	12	45	88

6. (a) Discuss the similarities and differences between a conventional cellular radio system and a space-based (satellite) cellular radio system. What are the advantages and disadvantages of each system? Which system could support a larger number of users for a given frequency allocation? Why? How would this impact the cost of service for each subscriber? 10
- (b) Explain in detail capacity of cellular system. Explain the benefits of frequency Re-use and using Hexagonal cells and give the concept of Handoff and Handover. 10

#### Section IV

7. (a) What multiplexing schemes are used in GSM and for what purpose? Explain in detail GSM Traffic channels. 10

- (b) Summarize the main features of third generation mobile phone systems. How do they achieve higher capacities and higher data rates ? How does UMTS implement asymmetrical communication and different data rates. 10

8. Explain the following in detail :

- (a) FDMA
- (b) IMT-2000
- (c) IS-95
- (d) Frequency Reuse. 20

Roll No. ....

Total Pages : 03

**BT-8/M-16**

**8811**

**RADAR ENGINEERING**

**ECE-404-E Opt. (i)**

Time : Three Hours]

[Maximum Marks : 100

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Section.

**Section I**

1. (a) Draw the block diagram of Radar and explain its all components in detail. **10**
- (b) If the transmitted peak power of radar is 100 kW, pulse repetition frequency is 1000 pps and the pulse width is 1  $\mu$ s then calculate the average power in dbS ? **5**
- (c) What is the maximum unambiguous range ? How is it related with the pulse repetition rate ? **5**
2. (a) Describe the radar performance on the basis of :
  - (i) Transmitter power
  - (ii) Pulse repetition frequency. **10**

- (b) A radar is operating at 10 GHz with the peak power 500 kW, the power gain of antenna is 5000 and minimum power of receiver is  $10^{-14}$ . Calculate the maximum range of radar if the effective area of antenna is  $10 \text{ m}^2$  and radar cross section is  $4 \text{ m}^2$  ?

10

### Section II

3. (a) How do you find the relative velocity of a target using CW radar ? How does flicker noise affect its working ? 10
- (b) A target is closing on a radial of radar with relative velocity of 200 km/h. The CW radar is operating at 5 GHz. What will be the Doppler shift of the target ? What will be the Doppler shift if the target changes its course by  $30^\circ$  ? 10
4. (a) Explain the working of FMCW radar with the help of block diagram. 10
- (b) For a FMCW radar altimeter, operating at 4 GHz, calculate the beat frequency  $f_b$  between the transmitted and received signals when  $f = 30 \text{ kHz}$ ,  $R = 2.5 \text{ km}$  and  $f_m = 10 \text{ kHz}$  ? 5
- (c) Explain the limitations of MTI radar. 5

### Section III

5. (a) Explain Conical scanning method of tracking of an acquired target in detail. 10
- (b) Define tracking in range and explain split gate tracking technique. 10
6. (a) Explain the working of mono pulse tracking radar with the help of block diagram. 10
- (b) Explain the radar servo tracking system with the help of block diagram. 10

### Section IV

7. (a) Discuss the noise figure of a receiver and noise figure due to RF losses. 10
- (b) Explain a balanced Duplexer with diagram. 10
8. Write short notes on the following :
  - (a) Mixer 10
  - (b) Low noise front ends. 10

Roll No. ....

Total Pages : 04

**BT-8/M-16**

**8812**

**MULTIMEDIA COMMUNICATIONS**

**ECE-406-E**

Time : Three Hours]

[Maximum Marks : 100

**Note :** Attempt *Five* questions in all, selecting at least *one* question from each Section.

**Section I**

1. (a) With the aid of diagrams explain the meaning of the terms :  
Color gamut, Adaptive color mixing, Subtractive color mixing. **10**
- (b) With the aid of diagrams explain the principle of operation of a CO packet-mode network. Include in your explanation the need for a virtual connection/circuit, a virtual circuit identifier, and a routing table ? **10**
2. (a) Describe the terms : unformatted text, formatted text, hypertext. **5**
- (b) Define the aspect ratio of a display screen. Give *two* examples for current widely used screen sizes. **5**

- (c) Derive the bit rate that results from the digitization of a 525-line and a 625-line system using the 4 : 2 : 0 digitization format and interlaced scanning. Hence derive the amount of memory required to store a 2-hour movie/video ? 10

### Section II

3. (a) With the aid of a diagram identify the five main stages associated with the baseline mode of operation of JPEG and give a brief description of the role of each stage. 10
- (b) Assuming the bandwidth of a speech signal is from 50 Hz through to 10 kHz and that of music signal is from 15 Hz through 20 kHz, derive the bit rate that is generated by digitization procedure in each case assuming the Nyquist sampling rate is used with 12 bits per sample for the speech signal and 16 bits per sample for the music signal. Also derive the memory required to store a 20 min passage of stereophonic music. 10
4. (a) Briefly explain some of the features of video in multimedia applications and also explain the interlaced scanning principles. 10

- (b) The following character string is to be transmitted using Huffman coding :

ABACADABACADABACABAB

Derive the Huffman code tree.

Determine the savings in transmission bandwidth over normal ASCII and binary coding. 10

### Section III

5. (a) With the help of a diagram identify the 5 main stages associated with the baselined mode of operation of JPEG and give a brief description of the role of each stage. 10
- (b) State how the compression algorithm used with MPEG-1 differs from that used in the H.261 standard? 10
6. (a) Explain, why modifications to the received (broadcast) TV signal have to be made if the signal is to be displayed in a window of a computer monitor. Hence assuming the SIF format, derive the spatial resolution required with :
- (i) a 525-line
- (ii) a 625-line system 10

- (b) State the following relating to the CIF and QCIF formats of the H.261 encoding standard :
- (i) the horizontal and vertical resolution in pixels
  - (ii) the number of macroblocks per frame
  - (iii) the number of GOBs per frame. 10

#### Section IV

7. (a) With the help of a diagram explain in detail the concept of internet telephony ? 10
- (b) With the help of diagram explain the operation of a basic DPCM signal encoder and decoder. Also explain the sources of errors that can arise ? 10
8. Explain the following :
- (i) e-Mail
  - (ii) Arithmetic Coding
  - (iii) Internet Telephony
  - (iv) H.263. 20

Roll No. ....

Total Pages : 02

**BT-8/M-16**

**8815**

**EMBEDDED SYSTEM DESIGN**

**ECE-424-E**

Time : Three Hours]

[Maximum Marks : 100

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

**Unit I**

1. (a) What is an Embedded System ? Why is a microcontroller also called microcomputer ? Explain with an example. 8
- (b) What are the features of Harvard and Princeton architecture ? How can the Harvard mode be configured as the Princeton mode ? 12
2. (a) Explain the different types of microcontroller 4 bit, 8 bit, 16 bit and 32 bit microcontroller. 10
- (b) Why these days most microprocessor and microcontroller designs are based on an RISC core ? Explain in detail the advantages of using an RISC core. 10

## Unit II

3. Briefly describe PIC16C6X/7X architecture diagram and pipelining. 20
4. (a) Differentiate between movf, movlw, movwf and swapf instructions. Explain their uses with an example. 10  
(b) Explain direct and indirect addressing mode of PIC 16C6X/7X. 10

## Unit III

5. Describe functioning of PIC 16C6X/7X timers (TMR0, TMR1 and TMR2) and capture mode (CCP1, CCP2). 20
6. Write short notes on the following :
  - (a) Serial peripheral Interface
  - (b) UART. 10+10=20

## Unit IV

7. Write assembly language program for :
  - (a) Bit addressing
  - (b) Subroutine
  - (c) Timer Interrupt. 10+10=20
8. Describe the microcontroller interfacing diagram connection to the Music box and PWM motor control. 20

Roll No. ....

Total Pages : 03

BT-8/M-16

8818

TRANSDUCERS AND THEIR  
APPLICATIONS

ECE-430-E

Time : Three Hours]

[Maximum Marks : 100

**Note :** Attempt exactly *Five* questions, selecting at least *one* question from each of the Sections A, B, C and D.

**Section A**

1. (a) What is Transducer and what are the basic requirements of it ? 5
- (b) Why are electrical methods preferred for measurement of non-electrical quantities ? 5
- (c) What is Hall Effect transducer and for what purpose it is used ? 5
- (d) On what basis the classification of transducer made ? 5
  
2. (a) What do you mean by resistive transducer ? And also write the operating principle of resistance strain gauge transducer. 15

- (b) A resistance wire strain gauge uses a soft iron wire of small diameter. The gauge factor is +5.2. Neglecting the piezoresistive effect, calculate the Poisson's ratio. 5

### Section B

3. (a) Name down the different types of electrical pressure transducer. Describe *one* application for each type of transducer. 10
- (b) Explain, how an LVDT can be used for the measurement of pressure. 10
4. (a) Write notes on the following :
- (i) Thermo-electric sensor 5
  - (ii) Pyrometer 5
  - (iii) Semiconductor resistance sensors. 5
- (b) A platinum resistance thermometer has a resistance of  $200\Omega$  at  $20^\circ\text{C}$  temperature. Find the resistance at  $100^\circ\text{C}$  if the temperature coefficient of resistance of thermometer at  $20^\circ\text{C}$  is 0.004. 5

### Section C

5. Explain capacitive transducer in detail. Write the merits, demerits and application of Capacitive transducer ? 20

6. (a) What do you mean by Strain gauge transducer ?  
Why strain gauge are also called as piezoresistive strain gauge ? 15
- (b) For most of the metallic strain gauge the gauge factor  $G$  is nearly about 2, why ? 5

### Section D

7. (a) For the purpose of force measurement, how does linear variable differential transformer type force transducer work ? 10
- (b) Explain pneumatic load cell. 10
8. (a) Explain, how does inductive transducer employed for the measurement of torque, with suitable diagram ? 10
- (b) What do you understand by absorption dynamometer ? 10