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10EC/TE71

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021

Computer Communication Networks

Time: 3 hrs. Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART – A

1 a. Describe the ISO OSI reference model of a computer networks. Discuss the functions of each layer. **(10 Marks)**

b. Discuss dial-up MODEMS. **(06 Marks)**

c. Briefly explain services provided by telephone network. **(04 Marks)**

2 a. What is an ARQ? Describe in detail about Stop and Wait ARQ. **(08 Marks)**

b. With a neat diagram, explain HDLC frame format. **(08 Marks)**

c. Explain bit stuffing with an example. **(04 Marks)**

3 a. Compare pure ALOHA with slotted ALOHA. What are the reasons for poor channel utilization in ALOHA system. How the same is improved in CSMA? **(10 Marks)**

b. A pure ALOHA network transmits 200 bit from on a shared channel of 200 KBPS. What is the throughput if system produces (i) 500 frame/sec (ii) 250 frame/sec. **(04 Marks)**

c. Explain I-persistent and P-persistent schemes. **(06 Marks)**

4 a. Compare the data rates for Standard Ethernet, Fast Ethernet, Giga-bit Ethernet and Tea Giga-bit Ethernet. **(04 Marks)**

b. Explain 802.3 MAC frame format. **(08 Marks)**

c. Discuss IEEE 802.11 MAC Layer Wireless LAN in detail. **(08 Marks)**

PART – B

5 a. Explain the following connecting device:
(i) Repeater (ii) Bridge (iii) Router (iv) Gate way **(08 Marks)**

b. Explain Bus backbone and Star backbone networks. **(08 Marks)**

c. Explain VLAN. **(04 Marks)**

6 a. What is NAT? Explain how NAT help in address depletion. **(05 Marks)**

b. Explain structure, address space, uni-cast address of IPV6 address with an example. **(10 Marks)**

c. Explain classful addressing of IPV4 with examples. **(05 Marks)**

7 a. With a suitable diagram, explain distance vector routing. **(10 Marks)**

b. Discuss different forwarding techniques with a neat figure. **(08 Marks)**

c. What do you mean by uni-cast? **(02 Marks)**

8 a. Describe a TCP connection establishment using three way handshake. **(10 Marks)**

b. Explain TCP with a neat diagram. Write UDP frame format. **(10 Marks)**

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10EC/TE72

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Optical Fiber Communication

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Summarize the inherent advantages of optical fiber over conventional copper cables. **(06 Marks)**

b. Describe with neat diagram different types of optical fiber waveguides. Using ray theory, explain the propagation of light inside the fiber. **(08 Marks)**

c. A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.5. A light ray is incidented at the core-cladding interface with a critical angle of 78.5°. Estimate:
i) Refractive index of cladding
ii) Numerical aperture
iii) The acceptance angle in air for the fiber **(06 Marks)**

2 a. Explain the different types of absorption losses in optical fiber. **(06 Marks)**

b. Derive an expression for pulse spreading due to material dispersion which is a function of wavelength and time delay. **(08 Marks)**

c. Explain the different types of bending losses in optical fiber. **(06 Marks)**

3 a. Draw and explain the cross-sectional view of a typical AlGaAs double heterojunction LED, along with the energy diagram. **(08 Marks)**

b. Sketch and explain the GaAs homojunction injection laser with a Fabry-Perot cavity. **(06 Marks)**

c. A planar LED is fabricated from Gallium Arsenide which has a refractive index of 3.6,
i) Calculate the optical power emitted into air as a percentage of the internal optical power for the device when the transmission factor at the crystal-air interface is 0.68.
ii) When the optical power generated internally is 50% of the electric power, determine the external power efficiency. **(06 Marks)**

4 a. Show that optical power coupled into a step index fiber due to an LED with lambartian distribution is given by $P = P_S(NA)^2$ for $r_S \leq a$, with usual notations. **(07 Marks)**

b. What are different types of mechanical misalignments? **(05 Marks)**

c. Explain briefly the various fiber splicing techniques. **(08 Marks)**

PART – B

5 a. Draw the signal path through an optical digital link showing all the relevant waveforms. **(06 Marks)**

b. Draw and explain the two general heterodyne receiver configurations, along with the relevant expressions for BER. **(08 Marks)**

c. Draw and explain the two types of front end amplifiers in optical fiber communication. **(06 Marks)**

6 a. Draw the block diagram, and explain the multichannel amplitude modulation technique used in fiber optics. **(08 Marks)**

b. Explain the significance of link power budget and system margin. The following optical link parameters are given :

Optical power launched	= 6 dBm
Receiver sensitivity	= –25 dBm
Source 1 detector connector loss	= 1 dB
Fiber cable length	= 100 km
Cable attenuation	= 0.1 dB/km
Jumper cable loss	= 3 dB
Connector loss at each joint	= 1dB

Assume two jumber cables and two cable joints. Compute link power margin. **(06 Marks)**

c. Derive the total system rise time expression for a digital optical link. **(06 Marks)**

7 a. Describe the operational principles of WDM, depicting the implementation of a typical WDM network containing various types of optical amplifier. **(08 Marks)**

b. With a neat diagram, explain the working principle of Mach-Zehnder inter-ferometer multiplexer. **(08 Marks)**

c. The input wavelengths of a 2 × 2 silicon Mach-Zehnder inter ferometer are separated by 10 GHz. The effective refractive index in the waveguide is 1.5. Calculate waveguide length difference. **(04 Marks)**

8 a. Explain in detail the amplification mechanism with energy level diagram in an EDFA. **(10 Marks)**

b. With suitable diagram describe SONET/SDH optical network function. **(10 Marks)**

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10EC74

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Embedded System Design

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. With a neat flow chart, explain the embedded system development process. **(10 Marks)**

b. Describe with neat block diagram a microprocessor based embedded system. **(10 Marks)**

2 a. What are the different computing engines available in embedded system? Explain each in detail. **(10 Marks)**

b. A microprocessor support 144 instructions and has 256 registers. Write the instruction format using 32 bit instruction register for 1–adderss, 2–adderss and 3–adderss instruction using big endian and little endian format. **(06 Marks)**

c. Write the c-code and assembly code to compare two numbers. If the two numbers are equal then perform addition of another two different variables are perform the subtraction operation using time different variables. **(04 Marks)**

3 a. Develop SRAM interface to microprocessor to store 4K words of 8bits, assuming that the largest memory device is of 1K of 8bit. Show detail design of the memory interface to microprocessor. **(06 Marks)**

b. Explain the internal diagram of DRAM and also explain read, write and refresh operation in DRAM. **(08 Marks)**

c. Describe direct mapping technique in cache with example. **(06 Marks)**

4 a. Explain with neat diagram :
i) Waterfall model
ii) V-cycle model
iii) Spiral model. **(12 Marks)**

b. Describe the role of system design specification in embedded system. **(08 Marks)**

PART – B

5 a. What is an operating system? Identify and explain the responsibility of an operating system. **(06 Marks)**

b. Explain the major states of task in an embedded system. **(08 Marks)**

c. Write the differences between :
i) Single thread and multiple threads
ii) Process and threads
iii) Foreground and background tasks. **(06 Marks)**

6 a. Write 'C' program to model simple kernel that perform three jobs namely bringing data, perform computation and display data, use array to model the queue. **(10 Marks)**

b. What is TCB? Explain the major components of TCB. **(06 Marks)**

c. What are the different kinds of stacks that are found in embedded system? Explain in brief. **(04 Marks)**

7 a. Write a 'C' function to find a factorial of a number. Analyze the complexity and write the complexity function. **(10 Marks)**

b. What is time loading? Explain the methods to compute the time. **(10 Marks)**

8 a. For the following C–code given, write the assembly language equivalent and analyze the execution time. The time required to execute different operation are push/pup in 600ns, arithmetic operation in 500ns, load/strobe/compare operation in 400ns, and conditional/unconditional branch operations in 800ns.

```
i) int a = 10 ;
   int b = 10 ;
      c = a + b ;

ii) If (a = = b)
       c = d + e ;
    else
       c = d – e

iii) While (myvar < 10)
      {
       i = i + 2 ;
       myvar ++ ;
      }
```

(10 Marks)

b. Discuss the optimization of power consumption in embedded system. **(10 Marks)**

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10EC751

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
DSP Algorithms and Architecture

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Explain the process of decimation and interpolation with block diagrams. **(08 Marks)**

b. The signal sequence x(n) = [0, 4, 8, 12, 16] is interpolated using the interpolation sequence $b_k = [1/4, 2/4, 3/4, 1, 3/4, 2/4, 1/4]$ and the interpolation factor is 4. Find the interpolated sequence y(m). **(08 Marks)**

c. An analog signal is sampled at a sampling rate of 8 KHz. If 512 samples of this signal are used to compute DFT, i.e., X(K), determine the frequency spacing between adjacent X(K) elements. Determine the analog frequency corresponding to K = 64, 128 and 200. **(04 Marks)**

2 a. Draw and explain 3 × 3 braces multiplier structure for unsigned integers. **(08 Marks)**

b. Identify the addressing modes of the operands in each of the following instruction and their operations. i) ADD B ii) ADD # 1234h iii) ADD 2233h iv) ADD * addrreg, offsetreg +. **(04 Marks)**

c. Discuss the features of address generation unit of a programmable DSP with the help of a diagram. **(08 Marks)**

3 a. Explain the operation of direct addressing made of TMS320C54XX processor with a diagram. **(07 Marks)**

b. Assuming the contents of AR3 to be 200h, what will be its contents after each of the following TMS320C54XX addressing modes is used? Assume that the contents of AR0 are 20h. i) *AR3 + 0 ii) *AR3 – 0 iii) *AR3 –
iv) *+AR3(40h) v) *+AR3(–40h) vi) *AR3 + OB. **(06 Marks)**

c. Discuss the features of program control unit of TMS320C54XX processor. **(07 Marks)**

4 a. Describe the operation of the following instructions :
i) MAC *AR2 –, *AR4+, B, A
ii) ADD # 2345h, –4, B, A
iii) MPY *AR3–, *AR4 + 0, B **(06 Marks)**

b. With the help of figure, explain the pipeline operation of the following sequence of instruction of the initial values of AR1, AR3, A are 104, 101, 2 and the values stored in memory locating 101, 102, 103, 104 are 4, 6, 8 12 (decimal value). Also provide the values of registers AR3, AR1, T and accumulator A and B after completion of each cycle.

```
ADD  *AR3+, A
LD   *AR1+, T
MPY  *AR3+, B
ADD   B, A
```

(08 Marks)

c. Describe the hardware timer on chip peripheral of TMS320C54XX processor with a block diagram. **(06 Marks)**

PART – B

5 a. Explain the significance of Q – notation in DSP. **(04 Marks)**

b. What values are represented by 16 bit numbers :

i) N = 4400h as Q15 notation

ii) N = 5736h as Q6 notation

iii) N = 3000h as Q12 notation. **(06 Marks)**

c. Explain the implementation of digital interpolation using FIR filter and poly-phase filter. **(10 Marks)**

6 a. Explain a general DIT FFT butterfly inplace computation structure. Also explain how scaling prevents overflow condition in the butterfly computation. **(12 Marks)**

b. Explain the bit reversed index generation for 8 point DIT FFT. **(05 Marks)**

c. Determine the following for a 256 point FFT computation :

i) Number of stages

ii) Number of butterflies in each stage

iii) Number of butterflies need for the entire computation. **(03 Marks)**

7 a. Explain the memory space of TMS320C54XX processor. **(04 Marks)**

b. Design a data memory system with address range 000800h – 000FFFh for a C5416 processor using 2K × 8 SRAM memory chips. **(08 Marks)**

c. Discuss the interrupt handling by the TMS320C54XX processor with the help of flow chart. **(08 Marks)**

8 a. Describe the PCM 3002 CODEC with the help of a block diagram. **(08 Marks)**

b. Explain encoding and decoding of JPEG image processing system using TMS320C54XX with relevant block diagrams. **(12 Marks)**

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10EC763

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Image Processing

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART - A

1 a. Explain the components of a general purpose image processing system, with block diagram. **(08 Marks)**

b. Describe Brightness adaptation and Weber ratio as applicable to Image processing. **(06 Marks)**

c. Explain the Image formation in the eye with example. **(06 Marks)**

2 a. Discuss Image Acquisition using Multi sensor array system. **(06 Marks)**

b. Describe the process of image sampling and quantization in the Digital Image Processing. **(06 Marks)**

c. Let V = {0, 1} and compute the D_4 and D_8 distance between p and q for the image segment. Indicate the shortest distance path.

	2	1	0	1	q
	0	0	2	0	
	1	0	1	1	
P	1	2	1	0	

(08 Marks)

3 a. Discuss the properties of 2 – D unitary transforms. **(08 Marks)**

b. For the given orthogonal matrix A and image U, obtain the transformed image V.

$$A = \frac{1}{\sqrt{2}}\begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} \quad U = \begin{bmatrix} 6 & 3 \\ 12 & 1 \end{bmatrix}.$$ **(06 Marks)**

c. Define two dimensional unitary DFT check whether unitary DFT matrix is unitary or not for N = 4. **(06 Marks)**

4 a. Explain Haar transform with its properties. Construct Haar transform matrix for n = 2 and compute the Haar transformation for 2 × 2 image shown below :

$$\begin{bmatrix} 3 & -1 \\ 6 & 2 \end{bmatrix}.$$ **(12 Marks)**

b. Define Hadmard transformation and generation Hadmard matrix Hn for n = 3 from the core matrix

$$H_1 = \frac{1}{\sqrt{2}}\begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}.$$ **(08 Marks)**

PART - B

5 a. Discuss the following enhancement operation to enhance the image :
i) Negative of image ii) contract stretching iii) Log transformation. **(09 Marks)**

b. Perform histogram equalization for the 32 ×32 image and its histogram is shown in table.

Gray level	0	1	2	3	4	5	6	7
No. of pixels	100	250	450	85	40	40	34	25

(11 Marks)

6 a. Describe the Laplacian filter to sharpen the images. **(06 Marks)**

b. Discuss in detail the basic steps for enhancing images in frequency domain, with block diagram. **(06 Marks)**

c. Explain different types of Low – pass filter in frequency domain. **(08 Marks)**

7 a. Describe the model of image degradation process. **(04 Marks)**

b. With probability density function, explain any three noises. **(06 Marks)**

c. What is the importance of adaptive filters in image restoration? Explain the adaptive median filter with example. **(10 Marks)**

8 a. Explain the intensity slicing and gray level colour transformation as applied to pseudo colour image processing. **(10 Marks)**

b. Describe the conversion of RGB colour model into HIS colour model and HIS to RGB. **(10 Marks)**

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