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15EC52

Fifth Semester B.E. Degree Examination, June/July 2019
Digital Signal Processing

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Describe the process of frequency domain sampling and reconstruction of discrete time signals. **(10 Marks)**

b. Using linearity property find the DFT of the sequence $x(n) = \cos\left(\frac{\pi n}{4}\right) + \sin\left(\frac{\pi}{2} n\right)$ consider N =4. **(06 Marks)**

OR

2 a. State and prove the i) circular time shift ii) circular time reversal properties of DFT. **(08 Marks)**

b. Solve by concentric circle or graphical method to find circular convolution $x(n) = \{1, 3, 5, 3\}$ and $h(n) = \{2, 3, 1, 1\}$. **(04 Marks)**

c. Derive the expression for the relationship of DFT with Z – transforms. **(04 Marks)**

Module-2

3 a. State and prove the following properties :
i) Circular correlation
ii) Parseval's theorem. **(06 marks)**

b. Consider a FIR filter with impulse response $h(n) = \{3, 2, 1, 1\}$. If the input is $x(n) = \{1, 2, 3, 3, 2, 1, -1, -2, -3, 5, 6, -1, 2, 0, 2, 1\}$. Find the output use overlap – same method. Assuming the length of block is 9. **(10 Marks)**

OR

4 a. Explain the linear filtering of long data sequences using overlap-add method. **(08 marks)**

b. An FIR filter has the impulse response of $h(n) = \left\{\underset{\uparrow}{1}, 2, 3\right\}$. Determine the response of the filter to the input sequence $x(n) = \left\{\underset{\uparrow}{1}, 2\right\}$ use DFT and IDFT and verify the result using direct computation of linear convolution. **(08 Marks)**

Module-3

5 a. Develop DIT–FFT algorithm and obtain the signal flow diagram for N = 8. **(08 Marks)**

b. Determine the IDFT of $X(K) = \{4, 1 - j2.414, 0, 1 - j0.414, 0, 1 + j0.414, 0, 1 + j2.414\}$ using inverse – radix 2 DIT – FFT algorithm. **(08 Marks)**

OR

6 a. Define chirp Z–transform. What are the applications of chirp–Z transform. **(04 Marks)**

b. The DFT of the following sequence using DIF – FFT algorithm
$x_1(n) = \{1, 1, 1, 0, 0, 1, 1, 1\}$ (ii) using the results in (i) Find DFT of signal $x_2(n) = \{1, 1, 1, 1, 1, 1, 0, 0, 1\}$ consider N = 8. **(12 Marks)**

Module-4

7 a. Obtain the direct form I, direct form II, cascade and parallel form realization for the following system. $y(n) = 0.75y(n-1) - 0.125y(n-2) + 6x(n) + 7x(n-1) + x(n-2)$. **(08 Marks)**

b. Realize the system given by the difference equation :
$y(n) = -0.1y(n-1) + 0.72y(n-2) + 0.7x(n) - 0.252\,x(n-2)$
Use parallel form. Is this system stable? Determine its impulse response. **(08 Marks)**

OR

8 a. Design an IIR digital filter that when used in the prefilter A/D – H(z) – D/A structure will SATISFY the following equivalent along specifications. **(10 Marks)**
i) LPF with –1dB cutoff at 100π rad/sec
ii) stopband attenuation of 35dB or greater at 1000π rad/sec.
iii) monotonic stop band and pass band
iv) sampling rate of 2000 samples/sec.

b. Obtain H(z) using impulse invariance method for the following analog filter 5Hz sampling frequency $H_a(S) = \dfrac{2}{(S+1)(s+2)}$. **(06 Marks)**

Module-5

9 a. Realize a linear phase FIR filter with the following impulse response.
$h(n) = \sigma(n) + \frac{1}{4}\sigma(n-1) - \frac{1}{8}\sigma(n-2) + \frac{1}{4}\sigma(n-3) + \sigma(n-4)$. **(06 Marks)**

b. Consider a 3–stage FIR lattice structure having the coefficients $K_1 = 0.65$, $K_2 = -0.34$, $K_3 = 0.8$. Evaluate its impulse response by tracing a unit impulse $\sigma(n)$ at its input through the Lattice structure. Also, draw its direct form–I structure. **(10 Marks)**

OR

10 a. the desired frequency response of a LPF

$$H_d(w) = \begin{cases} e^{-j3w} & |w| < 3\pi/4 \\ 0 & 3\pi/4 < |w| < \pi \end{cases}.$$

Find the impulse response h(n) using Hamming window. Determine the frequency response of FIR filter. Consider N = 7. **(10 Marks)**

b. Explain the following terms :
i) Hamming window
ii) Hanning window
iii) Bartlet window. **(06 Marks)**

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15EC53

Fifth Semester B.E. Degree Examination, June/July 2019
Verilog HDL

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Discuss different type of module level with an example. **(08 Marks)**

b. List the basic type of design methodology. Differentiate between them. **(08 Marks)**

OR

2 a. What do you mean by instantiation and instances? Write a verilog code for 4 bit ripple carry counter to show instantiation and instances. **(08 Marks)**

b. What is the need of stimulus block in simulation, discuss with an example. **(08 Marks)**

Module-2

3 a. List and explain different system tasks and compiler directives of verilog. **(10 Marks)**

b. List the components of a verilog module. Write a verilog code to list the components of SR latch. **(06 Marks)**

OR

4 a. Explain, how integer, real and time register data types used in verilog. **(08 Marks)**

b. Show how connections between signals are specified in the module instantiation and the parts in a module definition. **(08 Marks)**

Module-3

5 a. Discuss on And/Or Gates with respect to logic symbols, gate instantiation and truth tables. **(08 Marks)**

b. Design AOI based 4:1 multiplexer, write verilog description for the same and its stimulus. **(08 Marks)**

OR

6 a. List the characteristics of continuous assignments. **(04 Marks)**

b. Write the verilog description of 4 bit full adder using dataflow operators and with carry look ahead mechanism. **(06 Marks)**

c. Discuss briefly available gate delays in verilog. **(06 Marks)**

Module-4

7 a. Explain multiway branchings loops with examples. **(14 Marks)**

b. Outline the characteristics of parallel blocks. **(02 Marks)**

OR

8 a. List and discuss different delay based timing control. **(09 Marks)**

b. Differentiate between blocking and non blocking assignments. **(07 Marks)**

Module-5

9 a. List and explain the short comings of VHDL. **(04 Marks)**

b. List the different steps of VHDL design process for design synthesis? Discuss briefly. **(12 Marks)**

OR

10 a. Write VHDL code for 4 bit comparator using behavioral description style. **(05 Marks)**

b. Write VHDL code for full adder in structural description style using 2 half adders. **(05 Marks)**

c. Explain scalar data types of VHDL with examples. **(06 Marks)**

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15EC54

Fifth Semester B.E. Degree Examination, June/July 2019
Information Theory and Coding

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define information content, entropy and information rate. **(03 Marks)**

b. A card is selected at random from a deck of playing cards. If you are told that it is in red colour, how much information is conveyed? How much additional information is needed to completely specify a card? **(05 Marks)**

c. Prove the maximal property of entropy. **(08 Marks)**

OR

2 a. A DMS has an alphabet $X = \{x_1, x_2, x_3, x_4\}$ with probability statistics $\left\{\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{8}\right\}$ show that $H(X^2) = 2.H(x)$. **(06 Marks)**

b. For the Markov source shown in Fig.Q.2(b). Find state probability, state entropy and source entropy. Also, write tree diagram to generate message of length 2. **(10 Marks)**

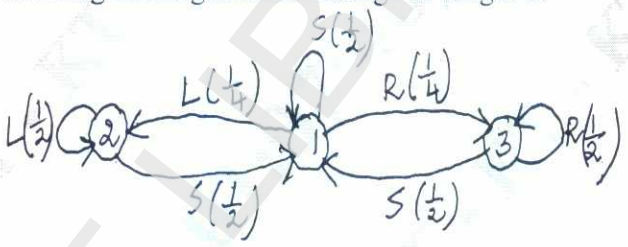

Fig.Q.2(b)

Module-2

3 a. Apply Shannon encoding algorithm and generation codes for the set of symbols $S = \{s_1, s_2, s_3, s_4, s_5, s_6\}$ with probability $P = \{0.3, 0.25, 0.20, 0.12, 0.08, 0.05\}$. Find code efficiency and variance. **(08 Marks)**

b. Using Shannon Fano algorithm, encode the following set of symbols and find the P(0) and P(1) {Probability of Zeros and ones}. **(05 Marks)**

Symbol	a	b	c	d	e	f	g
P	0.5	0.25	0.125	0.0625	0.03125	0.015625	0.015625

c. Write the decision tree for the following set of codes and check for KMI property:

S_1	1
S_2	01
S_3	001
S_4	0001
S_5	00001

(03 Marks)

OR

4 a. A DMS has an alphabet of seven symbols with probability statistics as given below:

$S = \{s_1, s_2, s_3, s_4, s_5, s_6, s_7\}$

$P = \left\{\frac{1}{4}, \frac{1}{4}, \frac{1}{8}, \frac{1}{8}, \frac{1}{8}, \frac{1}{16}, \frac{1}{16}\right\}$

Compute Huffman code for these set of symbols by moving the combined symbols as high as possible. Explain why the efficiency of the coding is 100%. **(08 Marks)**

b. Write a note on Lempel – Ziv Algorithm. **(04 Marks)**

c. Design compact Huffman code by taking the code alphabet $X = \{0, 1, 2\}$ for the set of symbols $S = \{s_1, s_2, s_3, s_4, s_5, s_6\}$, $P = \left\{\frac{1}{3}, \frac{1}{4}, \frac{1}{8}, \frac{1}{8}, \frac{1}{12}, \frac{1}{12}\right\}$. Find efficiency. **(04 Marks)**

Module-3

5 a. The TPM of a channel is given below. Compute H(x), H(y), H(x/y) and H(y/x)

$$P(xy) = \begin{bmatrix} 0.48 & 0.12 \\ 0.08 & 0.32 \end{bmatrix}$$ **(05 Marks)**

b. A binary symmetric channel has the following noise matrix. Compute mutual information, data transmission rate and channel capacity if $r_s = 10$ sym/sec

$$P(y/x) = \begin{bmatrix} 1/4 & 3/4 \\ 3/4 & 1/4 \end{bmatrix}$$

$$P(x) = \begin{bmatrix} \frac{1}{2} & \frac{1}{2} \end{bmatrix}$$ **(06 Marks)**

c. Derive an expression for the data transmission rate of binary Erasure channel. **(05 Marks)**

OR

6 a. An engineer says that he can design a system for transmitting computer output to a line printer operating at a speed of 30 lines/minute over a cabel having bandwidth of 3.5 kHz and $\frac{S}{N} = 30\text{dB}$. Assume that the printer needs 8 bits of data/character and prints out 80 characters/line. Would you believe the engineer? **(06 Marks)**

b. Write a note on differential entropy. **(05 Marks)**

c. Consider a binary symmetric channel whose channel matrix is given by $P(y/x) = \begin{bmatrix} 0.8 & 0.2 \\ 0.4 & 0.6 \end{bmatrix}$. Find channel capacity. **(05 Marks)**

Module-4

7 a. State error detecting and correcting capability of block codes. **(02 Marks)**

b. Consider a linear block code (6, 3). The check bits of this code are derived using the following relations:

$c_4 = d_1 + d_2$

$c_5 = d_1 + d_2 + d_3$

$c_6 = d_2 + d_3$

i) find generator matrix G

ii) find all code words of linear block code

iii) compute error detecting and correcting ability

iv) also find H and H^T. **(07 Marks)**

c. For a linear block code, the syndrome is given by:
$S_1 = r_1 + r_2 + r_3 + r_5$ $S_2 = r_1 + r_2 + r_4 + r_6$ $S_3 = r_1 + r_3 + r_4 + r_7$
i) Find H matrix ii) Draw syndrome calculator circuit iii) Draw encoder circuit. **(07 Marks)**

OR

8 a. A (7, 3) Hamming code is generated using $g(x) = 1 + x + x^2 + x^4$. Design a suitable encoder to generate systematic cyclic codes. Verify the circuit operation for D = [110]. Also, generate the code using mathematical computation. **(08 Marks)**

b. Design a syndrome calculator circuit for (7, 4) cyclic code having the generator polynomial $g(x) = 1 + x + x^3$. Verify the circuit operation using R = [1101001]. Also, perform the relevant mathematical computations. **(08 Marks)**

Module-5

9 a. Write an explanatory note on BCH codes. **(05 Marks)**

b. Consider the (3, 1, 2) convolutional encoder with $g^{(1)} = (110)$ $g^{(2)} = (101)$, $g^{(3)} = (111)$
i) Find constraint length
ii) Find rate efficiency
iii) Draw encoder diagram
iv) Find the generator matrix
v) Find the code for the message sequence (11101) using matrix and frequency domain approach. **(11 Marks)**

OR

10 a. For (2, 1, 3) convolutional encoder with $g^{(1)} = (1101)$, $g^{(2)} = (1011)$.
i) Write state transition table
ii) State diagram
iii) Draw the code tree
iv) Draw the trellis diagram
v) Find the encoded output for the message (11101) by traversing the code tree. **(10 Marks)**

b. Explain Viterbi decoding. **(06 Marks)**

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15EC553

Fifth Semester B.E. Degree Examination, June/July 2019
Operating Systems

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain operations of OS. **(08 Marks)**

b. Explain resource allocation techniques. **(08 Marks)**

OR

2 a. Write short notes on various classes of OS. **(08 Marks)**

b. Explain the architecture support required to have multiprogramming OS and the key concepts and techniques used in multiprogramming OS to improve throughput. **(08 Marks)**

Module-2

3 a. With the help of a state transition diagram explain fundamental state transitions of a process. **(08 Marks)**

b. Explain fields of process control block. **(05 Marks)**

c. What are the advantages of threads over process? **(03 Marks)**

OR

4 a. Determine mean turn around and weighted turnaround for the given set of processes using i)SRN ii) LCN scheduling policies

Process	P_1	P_2	P_3	P_4	P_5
Admission time	0	2	3	4	8
Service time	3	3	5	2	3

(08 Marks)

b. Explain functions of long, medium and short Schedulers in a time sharing system. **(08 Marks)**

Module-3

5 a. Define : i) memory fragmentation ii) memory compaction. **(02 Marks)**

b. Compare contiguous and noncontiguous memory allocation. **(06 Marks)**

c. Explain paging and segmentation. **(08 Marks)**

OR

6 a. Define : i) virtual memory ii) page fault iii) page in operation iv) page out operation. **(02 Marks)**

b. Explain demand loading of a page with the help of figure. **(06 Marks)**

c. For the following page reference and reference time strings for a process find the number of page faults with $alloc_i = 3$ using i) FIFO ii) LRU page replacement policies.

Page reference string	5	4	3	2	1	4	3	5	4	3	2	1	5
Reference time string	t_1	t_2	t_3	t_4	t_5	t_6	T_7	t_8	t_9	t_{10}	t_{11}	t_{12}	t_{13}

(08 Marks)

Module-4

7	a.	What are the facilities provided by the file system and the IOCS?	(04 Marks)
	b.	What are the file operations performed by processes.	(06 Marks)
	c.	Explain index sequential file organization.	(06 Marks)

OR

8	a.	List the fields in the File Control Block (FCB).	(04 Marks)
	b.	Explain indexed allocation of disk space.	(06 Marks)
	c.	Explain file system actions at open and close.	(06 Marks)

Module-5

9	a.	Explain : i) direct and indirect naming ii) blocking and non-blocking sends.	(04 Marks)
	b.	Explain buffering of interprocess messages.	(06 Marks)
	c.	Write short notes on mailboxes.	(06 Marks)

OR

10	a.	Define deadlock and explain conditions for a resource deadlock.	(04 Marks)
	b.	Explain deadlock detection algorithm.	(06 Marks)
	c.	Briefly describe deadlock handling approaches.	(06 Marks)

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CBCS SCHEME

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Fifth Semester B.E. Degree Examination, June/July 2019
Object Oriented Programming Using C++

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What is C++? How is it different form C? **(06 Marks)**
b. List and explain the various data types in C++? **(06 Marks)**
c. Write a note on : i) Enumerated Data Type ii) Const and Volatile. **(04 Marks)**

OR

2 a. Discuss the types of operators supported in C++. **(06 Marks)**
b. Illustrate the difference between pointers and reference variables in C++. **(04 Marks)**
c. Explain loops in C++? Give example. **(06 Marks)**

Module-2

3 a. Design a function call cal_SI( ), that has three parameters, principle, tenure, rate. Provide default argument to rate. Write a C++ program to find the simple interest using the above function. **(06 Marks)**
b. What are static variables and functions in C++. **(04 Marks)**
c. What are local classes in C++? Illustrate with an example program. **(06 Marks)**

OR

4 a. Define friend function. Demonstrate with an example program. **(06 Marks)**
b. With an example, mention the various circumstances in which, the scope resolution operators are used. **(06 Marks)**
c. Write a C++ program to overload tow function to find area of a circle and square. **(04 Marks)**

Module-3

5 a. What is a constructor? Write the need of constructor in a class. **(04 Marks)**
b. Can a class have many constructors? Justify. **(04 Marks)**
c. Create a class called Clock with data members as hour, minute and member functions readtime ( ), showtime ( ). Write a C++ program to input two clock objects and add using operator overloading +. **(08 Marks)**

OR

6 a. What is a destructor? Mention the destructor rules. **(04 Marks)**
b. Demonstrate unary operator and binary operator overloading. **(08 Marks)**
c. What is nesting of member functions? **(04 Marks)**

Module-4

7 a. Discuss base class and derived class with suitable example. **(04 Marks)**
b. What is Hybrid Inheritance? Explain the diamond problem of inheritance in C++ with suitable example. **(08 Marks)**
c. List the rules for virtual function in C++. **(04 Marks)**

OR

8 a. Give the significance of 'this' pointer with a program. **(06 Marks)**

b. What is an abstract class? Write the advantages with an example program. **(06 Marks)**

c. Differentiate virtual and pure virtual functions. **(04 Marks)**

Module-5

9 a. Explain the stream class hierarchy with a neat diagram. **(08 Marks)**

b. Describe the following unformatted I/O functions.
i) get( ) ii) put( ) iii) getline( ) d) write( ). **(08 Marks)**

OR

10 a. Write the syntax and example to create user defined manipulators. **(05 Marks)**

b. Write a C++ program to copy the content of one file to another. **(07 Marks)**

c. Why it is necessary to detect the EOF? Give example. **(04 Marks)**

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15EC563

Fifth Semester B.E. Degree Examination, June/July 2019
8051 Microcontroller

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. i) Differentiate between microprocessor and microcontroller. **(04 Marks)**

ii) What is an Embedded Microcontroller and What is an Embedded System? **(02 Marks)**

b. Sketch the neat diagram of 8051 PIN-OUT and explain its pins:
ALE, RST, $\overline{PSEN}$, $\overline{EA}$, $\overline{RD}$, $\overline{WR}$, TXD and RXD **(10 Marks)**

OR

2 a. Explain the organization of internal RAM memory of 8051. **(08 Marks)**

b. Show the interfacing connections of external EPROM and RAM to the 8051 Microcontroller and explain how 8051 access them. **(08 Marks)**

Module-2

3 a. Explain the four data addressing modes of an 8051 microcontroller with an example for each. **(06 Marks)**

b. Explain the following instructions:
i) XCHD A, @R_0
ii) SWAP A
iii) MOVC A, @A+DPTR
iv) CJNE A, 10H, LOOP
v) DA A **(10 Marks)**

OR

4 a. Explain Jump Instructions of 8051 with their ranges of Jump. **(06 Marks)**

b. Write an ALP to find the value of an expression $S = [(M/N) + 30H]$ values of M and N are stored in the internal memory locations 22H and 23H respectively. Store the result in 24H. **(06 Marks)**

c. Explain the Logical OR instruction with all possible addressing modes. **(04 Marks)**

Module-3

5 a. Write an ALP to find the Largest number in an array of 10 bytes, stored in the internal memory block starting with 20 H. Store the result at 60 H. **(08 Marks)**

b. Write an ALP to find sum of ten 8-bit numbers, stored in the internal memory block starting with 30H. Store the 16 bit sum at locations 40H and 41H. **(08 Marks)**

OR

6 a. Explain the operation of PUSH and POP and LCALL, ACALL and RET instructions of 8051 giving all the steps involved. **(08 Marks)**

b. Write an ALP to transfer 10 bytes of data from location starting with 8030H to location starting with 8041H without overlap. **(08 Marks)**

Module-4

7 a. Explain TMOD register format of 8051. **(04 Marks)**

b. Explain MODE-1 programming of Timers of 8051. **(04 Marks)**

c. Write an ALP to generate square wave a frequency of 100 kHz on Pin P1.1. Assume crystal frequency, XTAL = 12 MHz. Use Timer1 in Mode 1. **(08 Marks)**

OR

8 a. Explain the principle of operation of serial port of 8051 to transmit and receive a character serially. **(06 Marks)**

b. Explain the following RS232 Handshaking signals: RTS and DTR. **(02 Marks)**

c. Write an 8051 C program to transfer the message 'GOD' serially at 9600 baud rate with XTAL = 11.0592 MHz. **(08 Marks)**

Module-5

9 a. Interface 8051 to a stepper motor and write an ALP to rotate it 64° in clockwise direction. Step Angle = 2°. **(08 Marks)**

b. Explain the different interrupts of 8051 (both external and internal). How to enabled mask them? **(08 Marks)**

OR

10 a. Write a 'C' program using interrupts to do following:

i) Receive data serially and send it to P_0.

ii) Read Port P1, transmit data serially and give a copy to P_2.

iii) Make timer 0, to generate a square wave of 5 kHz frequency on $P_{1.1}$.

Assume XTAL = 11.0592 MHz with baud rate at 4800. **(08 Marks)**

b. Write a C program to send 'M', 'D', 'E' to the LCD using delays. **(08 Marks)**

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