CBCS SCHEME

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17EC52

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Digital Signal Processing

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Show that finite duration sequence of length L can be reconstructed from the equidistant N samples of its Fourier transform, where $N \geq L$. **(06 Marks)**

b. Compute the 6 – point DFT of the sequence $x(n) = \{1, 0, 3, 2, 3, 0\}$. **(08 Marks)**

c. Find the N-point DFT of the sequence $x(n) = a^n$, $0 \leq n \leq N-1$. **(06 Marks)**

OR

2 a. Determine the 6-point sequence x(n) having the DFT $X(K) = \{12, -3 - j\sqrt{3}, 0, 0, 0, -3 + j\sqrt{3}\}$. **(08 Marks)**

b. Derive the equation to express z – transform of a finite duration sequence in terms of its N-point DFT. **(06 Marks)**

c. Compute the circular convolution of the sequences $x_1(n) = \{1, 2, 2, 1\}$ and $x_2(n) = \{-1, -2, -2, -1\}$. **(06 Marks)**

Module-2

3 a. State and prove the modulation property (multiplication in time-domain) of DFT. **(06 Marks)**

b. The even samples of an eleven-point DFT of a real sequence are : $X(0) = 8$, $X(2) = -2 + j3$, $X(4) = 3 - j5$, $X(6) = 4 + j7$, $X(8) = -5 - j9$ and $X(10) = \sqrt{3} - j2$. Determine the odd samples of the DFT. **(06 Marks)**

c. An LTI system has impulse response $h(n) = \{2, 1, -1\}$. Determine the output of the system for the input $x(n) = \{1, 2, 3, 3, 2, 1\}$ using circular convolution method. **(08 Marks)**

OR

4 a. State and prove circular time reversal property of DFT. **(06 Marks)**

b. Determine the number of real multiplications, real additions, and trigonometric functions required to compute the 8-point DFT using direct method. **(04 Marks)**

c. Find the output y(n) of a filter whose impulse response is $h(n) = \{1, 2, 1\}$, and the input is $x(n) = \{3, -1, 0, 1, 3, 2, 0, 1, 2, 1\}$ using overlap – add method, taking $N = 6$. **(10 Marks)**

Module-3

5 a. Compute the 8-pont DFT of the sequence $x(n) = \cos(\pi n/4)$, $0 \leq n \leq 7$, using DIT–FFT algorithm. **(10 Marks)**

b. Given $x(n) = \{1, 2, 3, 4\}$, compute the DFT sample X(3) using Goestzel algorithm. **(06 Marks)**

c. Determine the number of complex multiplications and complex additions required to compute 64-point DFT using radix.2 FFT algorithm. **(04 Marks)**

OR

6 a. Determine the sequence x(n) corresponding to the 8-point DFT X(K) = {4, 1–j2.414, 0, 1–j0.414, 0, 1+j0.414, 0, 1+j2.414} using DIF-FFT algorithm. **(10 Marks)**

b. Draw the signal flow graph to compute the 16-point DFT using DIT-FFT algorithm. **(04 Marks)**

c. Write a short note on Chirp–z transform. **(06 Marks)**

Module-4

7 a. Draw the direct form I and direct form II structures for the system given by :

$$H(z) = \frac{z^{-1} - 3z^{-2}}{1 + 4z^{-1} + 2z^{-2} - 0.5z^{-3}}.$$ **(08 Marks)**

b. Design a digital Butterworth filter using impulse–invariance method to meet the following specifications :

$0.8 \le |H(\omega)| \le 1, \quad 0 \le \omega \le 0.2\pi$

$|H(\omega)| \le 0.2, \quad 0.6\pi \le \omega \le \pi$

Assume T = 1. **(12 Marks)**

OR

8 a. Draw the cascade structure for the system given by :

$$H(z) = \frac{(z-1)(z-3)(z^2+5z+6)}{(z^2+6z+5)(z^2-6z+8)}.$$ **(08 Marks)**

b. Design a type–1 Chebyshev analog filter to meet the following specifications :

$-1 \le |H(\Omega)|\,dB \le 0, \quad 0 \le \Omega \le 1404\pi$ rad/sec

$|H(\Omega)|\,dB \le -60, \quad \Omega \ge 8268\pi$rad/sec **(12 Marks)**

Module-5

9 a. Realize the linear phase digital filter given by :

$$H(z) = 1 + \frac{1}{2}z^{-1} + \frac{1}{3}z^{-2} + \frac{2}{5}z^{-3} + \frac{1}{3}z^{-4} + \frac{1}{2}z^{-5} + z^{-6}$$ **(06 Marks)**

b. List the advantages and disadvantages of FIR filter compared with IIR filter. **(04 Marks)**

c. Determine the values of h(n) of a detail low pass filter having cutoff frequency $\omega_C = \pi/2$ and length M = 11. Use rectangular window. **(10 Marks)**

OR

10 a. An FIR filter is given by : $y(n) = x(n) + \frac{2}{5}x(n-1) + \frac{3}{4}x(n-2) + \frac{1}{3}x(n-3)$. Draw the Lattice structure. **(06 Marks)**

b. Determine the values of filter coefficients h(n) of a high–pass filter having frequency response :

$$H_d(e^{j\omega}) = 1, \quad \frac{\pi}{4} \le |\omega| \le \pi$$

$$= 0, \quad |\omega| \le \frac{\pi}{4}$$

Choose M = 11 and use Hanning windows. **(10 Marks)**

c. Write the time domain equations, widths of main lobe and maximum stop band attenuation of Bartlett window and Hanning window. **(04 Marks)**

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17EC54

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Information Theory and Coding

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Suppose you are planning a trip to Miami, Florida from Minneapolis in the winter time. You are receiving the following information from Miami Weather bureau:
(i) Mild and Sunny day (ii) Cold day (iii) Possible snow flurries
Explain the amount of information content in each statement. **(06 Marks)**

b. The output of an information source consists of 128 symbols, 16 of which occurs with probability of $\frac{1}{32}$ and the remaining 112 occurs with probability of $\frac{1}{224}$. The source emits 1000 symbols/sec. Assuming that the symbols are chosen independently. Find the Average Information Rate of this source. **(06 Marks)**

c. The state diagram of a stationary Mark off Source is shown in Fig.Q1(c):
(i) Find the entropy of each state
(ii) Find the entropy of the source
(iii) Find G_1 and G_2 and verify that $G_1 \geq G_2 \geq H$.
Assume $P(1) = P(2) = P(3) = \frac{1}{3}$

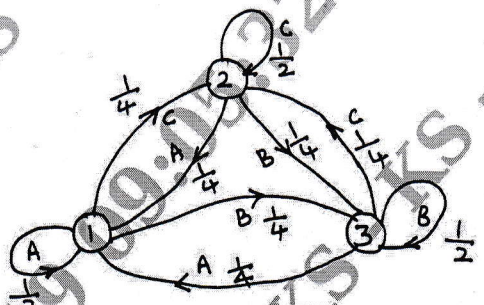

Fig.Q1(c) **(08 Marks)**

OR

2 a. What is self information? Mentions its various measuring units and also mentions the reasons for choosing logarithmic function. **(06 Marks)**

b. A binary source is emitting an independent sequence of 0's 1's with probabilities of P and 1 – P respectively. Plot the entropy of this source versus probability. **(06 Marks)**

c. For the first order Markov statistical model as shown in Fig.Q2(c).
(i) Find the probability of each state (ii) Find H(s) and $H(s^{-2})$

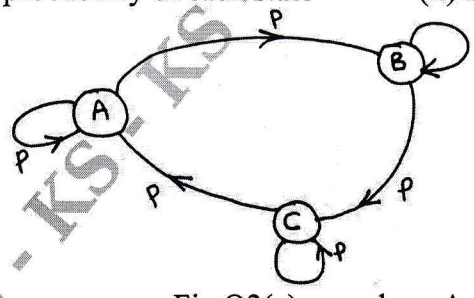

Fig.Q2(c) where A, B, and C are the states. **(08 Marks)**

Module-2

3 a. Identify whether the codes shown in Table.Q3(a) are instantaneous. Justify your answer.

Symbols	Code A	Code B	Code C
S_1	00	1	0
S_2	01	01	100
S_3	10	001	101
S_4	11	00	111

Table.Q3(a) **(06 Marks)**

b. Consider a Discrete Memory Source (DMS) with S = {X, Y, Z} with P = {0.6, 0.2, 0.2}. Find the code word for the message "YXZXY" using Arithmetic code. **(06 Marks)**

c. An information source produces a sequence of independent symbols having the following probabilities. More composite symbol as slow as possible.

Symbol	A	B	C	D	E	F	G
Probabilities	$\frac{1}{3}$	$\frac{1}{27}$	$\frac{1}{3}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{27}$	$\frac{1}{27}$

Construct Binary Huffman encoding and find its efficiency. **(08 Marks)**

OR

4 a. Write the Shannon's Encoding Algorithms. **(06 Marks)**

b. Consider the following source with probabilities:

S = {A, B, C, D, E, F} P = {0.4, 0.2, 0.2, 0.1, 0.08, 0.02}

Find the code words using Shannon-Fano algorithm and also find its efficiency. **(06 Marks)**

c. Consider the following discrete memoryless source:

$S = \{S_0, S_1, S_2, S_3, S_4\}$ $P = \{0.55, 0.15, 0.15, 0.1, 0.05\}$

Compute Huffman code by placing composite symbol as high as possible. Also find average code word length and variance of the code word. **(08 Marks)**

Module-3

5 a. What is Joint Probability Matrix? How it is obtained from Channel Matrix and also mention properties of JPM. **(06 Marks)**

b. For the communication channel shown in Fig.Q5(b), determine Mutual Information and Information Rate if r_s = 1000 symbols/sec. Assume $P(X_1) = 0.6$ and $P(X_2) = 0.4$.

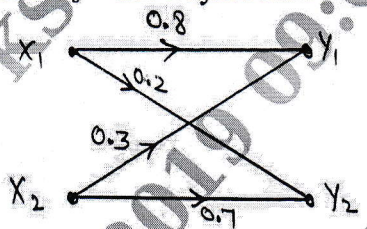

Fig.Q5(b)

(06 Marks)

c. Discuss the Binary Erasure Channel and also prove that the capacity a Binary Erasure Channel is $C = \overline{P} \cdot r_s$ bits/sec. **(08 Marks)**

OR

6 a. What is Mutual Information? Mention its properties. **(06 Marks)**

b. The noise characteristics of a channel shown in Fig.Q6(b). Find the capacity of a channel if r_s = 2000 symbols/sec using Muroga's method.

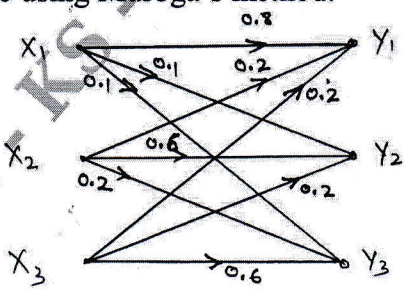

Fig.Q6(b)

(06 Marks)

c. State and prove the Shannon-Hartley Law. **(08 Marks)**

Module-4

7 a. What are the advantages and disadvantages of Error Control Coding? Discuss the methods of controlling Errors. **(06 Marks)**

b. The parity check bits of a (7, 4) Hamming code are generated by

$C_5 = d_1 + d_3 + d_4$

$C_6 = d_1 + d_2 + d_3$

$C_7 = d_2 + d_3 + d_4$

where d_1, d_2, d_3 and d_4 are the message bits.

(i) Find G and H for this code.

(ii) Prove that $GH^T = 0$. **(06 Marks)**

c. Design a syndrome calculating circuit for a (7, 4) cyclic code with $g(X) = 1 + X + X^3$ and also calculate the syndrome of the received vector R = 1110101. **(08 Marks)**

OR

8 a. For a systematic (6, 3) linear block code, the Parity Matrix P is given by

$$[P] = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

(i) Find all possible code words.

(ii) Find error detecting and correcting capability. **(06 Marks)**

b. A (7, 4) cyclic code has the generator polynomial $g(X) = 1 + X + X^3$. Find the code vector both in systematic and non-systematic form for the message bits (1101). **(06 Marks)**

c. Draw the Encoder circuit of a cyclic code using (n – K) bit shift Registers and explain it. **(08 Marks)**

Module-5

9 a. Consider (3, 1, 2) Convolution Encoder with $g^{(1)} = 110$, $g^{(2)} = 101$ and $g^{(3)} = 111$.

(i) Draw the encoder diagram.

(ii) Find the code word for the message sequence (11101) using generator Matrix and Transform domain approach. **(16 Marks)**

b. Discuss the BCH codes. **(04 Marks)**

OR

10 a. Consider the convolution encoder shown in Fig.Q10(a).

(i) Write the impulse response and its polynomial.

(ii) Find the output corresponding to input message (10111) using time and transform domain approach.

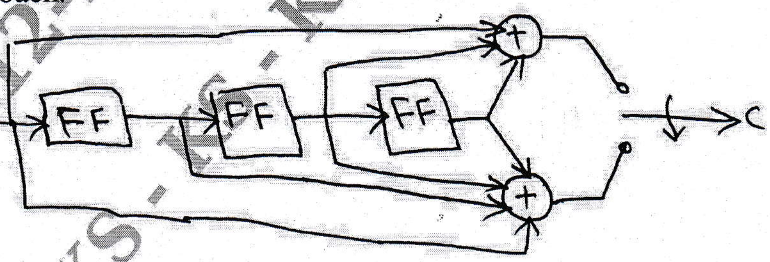

Fig.Q10(a) **(16 Marks)**

b. Write a note on Golay codes. **(04 Marks)**

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17EC553

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Operating System

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define operating system. Explain the key concern and of an operating system. **(07 Marks)**
b. Explain the various resource allocation and resource sharing strategies. **(08 Marks)**
c. What are the common tasks performed by an operating system? **(05 Marks)**

OR

2 a. Explain briefly, the different classes of operating system with primary concern and key concepts. **(10 Marks)**
b. With a neat diagram explain the turnaround time in batch processing system. **(06 Marks)**
c. Discuss various computations in an operating system. **(04 Marks)**

Module-2

3 a. Define process, process states and with a state transition diagram explain the state transition for a process. **(10 Marks)**
b. Discuss the different fields of the process control block (PCB). **(06 Marks)**
c. What are the differences between threads and processes? **(04 Marks)**

OR

4 a. For a given set of processes perform FCFS and SRN scheduling and compare their performance interms of mean turnaround time and weighted turn around. **(10 Marks)**

Process	P_1	P_2	P_3	P_4	P_5
Arrival time	0	2	3	5	9
Service time	3	3	2	5	3

b. With a neat sketch, explain long, medium and short term schedulers. **(06 Marks)**
c. Compare non-preemptive and preemptive scheduling concepts. **(04 Marks)**

Module-3

5 a. Define the following terms with necessary sketches :
i) Internal and external fragmentation
ii) Paging and segmentation
iii) Logical address and physical address.
iv) Page and page frame. **(12 Marks)**
b. With a neat diagram explain the working of address translation in non-contiguous memory allocation. **(08 Marks)**

OR

6 a. With a neat sketch, explain demand paging preliminaries. **(12 Marks)**
b. Consider the page reference string 0, 1, 2, 1, 3, 0, 4, 1, 2, 1, 3, 7, 4, 5, 7. Calculate the page faults. Using FIFO and LRU page replacement policies with a frame size 3. **(08 Marks)**

Module-4

7 a. Explain file system and IOCS with necessary sketches. **(08 Marks)**

b. Explain any three allocation methods of disk space for files and mention advantages and disadvantages of each. **(12 Marks)**

OR

8 a. What is a directory? Discuss typical directory entry fields and explain different directory structures. **(12 Marks)**

b. Discuss the working of file system action at file close. **(08 Marks)**

Module-5

9 a. Write a note on :

i) Issues in message passing

ii) Direct and indirect naming in message passing

iii) Blocking and non-blocking sends in message passing. **(12 Marks)**

b. Explain mailboxes, give the advantages of mail boxes. **(08 Marks)**

OR

10 a. With necessary sketches, explain the different deadlock prevention approaches. **(10 Marks)**

b. Using deadlock detection algorithm for the following example of system check, whether the deadlock exist in the system or not. **(10 Marks)**

	R_1	R_2	R_3
P_1	2	1	0
P_2	1	3	1
P_3	1	1	1
P_4	1	2	2

Allocated Resources

	R_1	R_2	R_3
P_1	2	1	3
P_2	1	4	0
P_3	0	0	0
P_4	1	0	2

Requested Resources

R_1	R_2	R_3
0	0	1

Free Resources

R_1	R_2	R_3
5	7	5

Total resources

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17EC562

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Object Oriented Programming Using C++

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain the application of C++. **(04 Marks)**

b. What is dynamic memory management? Explain. 'new' and 'delete' operator with an example program. **(08 Marks)**

c. Differentiate between structures and unions. **(08 Marks)**

OR

2 a. Write a C++ program to check whether the given number is prime or not. **(07 Marks)**

b. Explain reference variables with a suitable example. **(04 Marks)**

c. Explain the control structures – for, while and do-while with their syntax. **(09 Marks)**

Module-2

3 a. Explain call by reference argument passing mechanism with an example program to swap two numbers. **(08 Marks)**

b. Write a short note about inline fucntions. **(04 Marks)**

c. Define classes and objects. Explain about public and private members of a class with an example. **(08 Marks)**

OR

4 a. Write a program to create a class STUDENT consisting of name, usn and marks as class data variables. Create three objects for the class using the concept array of objects. Write member functions to read and display the student information. Also write the main program to create objects and call the member functions from the class. **(10 Marks)**

b. Explain how an object can be used as a function argument with the help of an example program to perform the addition of two time objects in hour and minute format, display the result in hour : minute format. **(10 Marks)**

Module-3

5 a. Explain parameterized constructor and copy constructor with example programs. **(08 Marks)**

b. Define destructor with its features and syntax. **(06 Marks)**

c. Explain dynamic constructor with an example. **(06 Marks)**

OR

6 a. Discuss about operator overloading in C++. Write a program in C++ to overload unary minus operator. **(10 Marks)**

b. Write a program to add two complex numbers by overloading binary (+) operator and explain the implementation of overloading '+' operator. **(10 Marks)**

Module-4

7 a. Explain inheritance in C++ with its advantages. **(04 Marks)**

b. Explain multiple inheritances with an example program. **(10 Marks)**

c. Write short notes about inheritance visibility mode. **(06 Marks)**

OR

8 a. Explain 'this' pointer in C++ with an example. **(08 Marks)**
b. Explain virtual function with an example program. **(12 Marks)**

Module-5

9 a. Explain C++ stream classes used fro input and output operations with the console unit. **(10 Marks)**
b. Explain formatted I/O operation functions used in C++ with syntax and example. **(10 Marks)**

OR

10 a. Discuss about the classes for file stream operation and explain how file opening and closing is done in C++. **(12 Marks)**
b. Write a C++ program to open a file using open( ) function. Write some text into the file and read all lines in the file. **(08 Marks)**

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17EC563

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
8051 Microcontroller

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Write the comparison between Microprocessor and Microcontroller. **(05 Marks)**

b. Define Embedded System and write the characteristics of an Embedded System. **(05 Marks)**

c. Write and explain the Architecture of 8051 Microcontroller and also explain the PSW, RAM memory organization. **(10 Marks)**

OR

2 a. Write and explain the pin diagram of 8051 Microcontroller. **(10 Marks)**

b. Explain the Interfacing of 16K EPROM and 8K RAM to 8051 Microcontroller. **(10 Marks)**

Module-2

3 a. Write and explain the Addressing modes of 8051 Microcontroller with an example. **(10 Marks)**

b. Explain the following instructions with an example:
(i) DJNZ R_n, rel
(ii) MOVC A, @A+DPTR
(iii) RRC A
(iv) PUSH 02
(v) DAA **(10 Marks)**

OR

4 a. Explain Call and Jump Instructions. **(06 Marks)**

b. Explain any four directives. **(04 Marks)**

c. Write and explain an Assembly Language Program to divide the data in RAM location in 38H by data in 15H and store the quotient in 70H and remainder in 71H. **(10 Marks)**

Module-3

5 a. Write and explain an Assembly Language Program to transfer five 8-bit of data from starting memory location 30H to other memory starting at 40H. **(08 Marks)**

b. Write and explain an Assembly Language Program to find largest 8-bit number form the given five 8-bit numbers. **(08 Marks)**

c. Write and explain an Assembly Language Program to toggle all the bits of port 1, with a time delay between toggling. **(04 Marks)**

OR

6 a. Write and explain an Assembly Language Program to read the lower nibble of data by P_0 is to be displayed on LEDS are connected to upper 4-bits of P_1. **(10 Marks)**

b. Write and explain an Assembly Language Program to Add two 32-bit numbers. The numbers are stored from RAM location 40H and 50H respectively. Store the result from RAM location 60H. **(10 Marks)**

Module-4

7 a. Explain TMOD and TCON registers. **(08 Marks)**

b. Write and explain an Assembly language program to toggle $P_{1.5}$ every 1 second. Use Timer1 in mode1. Assume crystal oscillator frequency is 11.0592 MHz. **(08 Marks)**

c. Explain SCON register. **(04 Marks)**

OR

8 a. Write and explain a C program and assembly to generate a square wave of frequency 10 kHz on Pin 1.4. Use timer0 in mode2 with a crystal frequency of 22 MHz. **(10 Marks)**

b. Write and explain a C program and assembly to transfer "VTU" serially with a baud rate of 9600. Assume crystal oscillator frequency is 11.0592 MHz. **(10 Marks)**

Module-5

9 a. Explain IE register. **(04 Marks)**

b. Write and explain a C program and assembly to generate a square wave on $P_{2.4}$ with high of 1 ms and low portion of 2 ms using timer1 in interrupt mode with a crystal oscillator frequency of 11.0592 MHz and also read the value of port0 and display is on port1. **(08 Marks)**

c. Write and explain an assembly language program to do the following:
(i) Reads data from port P_1 and writes it to P_2 continuously.
(ii) Also the data at P_1 is transferred serially.
(iii) The data received serially is displayed at P_0.
Assume 11.0592 MHz crystal frequency 9600 baud rate. **(08 Marks)**

OR

10 a. Write and explain a C program and assembly to interface an ADC 0804 to 8051 Microcontroller and display on P_2. **(10 Marks)**

b. Write and explain a C program and assembly to monitor the status of a switch SW connected to Pin P2.7 and perform the following:
(i) If SW = 0, the stepper motor rotates clockwise.
(ii) If SW = 1, the stepper motor rotates in anticlockwise.
Use the wave-drive 4-step sequence. **(10 Marks)**

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