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15EC52

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Derive the expression for DFT and IDFT by using frequency domain sampling of DTFT. **(08 Marks)**

b. Find IDFT of X(k) = {4, -j2, 0, j2}. **(04 Marks)**

c. Determine the circular convolution of the sequences $x_1(n) = \{2, 4, 6, 3\}$ $x_2(n) = \{1, 3, 2, 1\}$. **(04 Marks)**

OR

2 a. Find the 8-point DFT of the sequence x(n) = {1, 1, 1, 1, 1, 1} by matrix method. **(08 Marks)**

b. Show that the multiplication of two DFT's leads to circular convolution of respective time sequences. **(08 Marks)**

Module-2

3 a. An FIR filter has the impulse response h(n) = {1, 2, 3}, determine the response of the filter for input sequence x(n) = {1, 2}. Use DFT and IDFT technique. **(08 Marks)**

b. In the direct computation of N-point DFT of x(n), how many
i) Complex multiplications
ii) Complex additions
iii) Real multiplications
iv) Real additions
v) Trigonometric functions, evaluations are required. **(08 Marks)**

OR

4 a. Find the output y(n) of a filter whose impulse response h(n) = {3, 2, 1, 1} and input x(n) = {1, 2, 3, 3, 2, 1, -1, -2, -3, 5, 6, -1, 2, 0, 2, 1}. Using overlap add method assuming the 7 point circular convolution. **(10 Marks)**

b. The 4 point DFT of a real sequence x(n) is X(k) = {1, j, 1, -j}. Find the DFT's of the following sequence:
i) $x_1(n) = (-1)^n x(n)$
ii) $x_2(n) = x((n+1))_4$
iii) $x_3(n) = x((4-n))_4$ **(06 Marks)**

Module-3

5 a. Derive 8-point DIT-FFT radix-2 algorithm and draw signal flow graph. **(08 Marks)**

b. Find IDFT of x(k) = {36, -4 + j9.7, -4 + j4, -4 + j1.7, -4, -4 – j1.7, -4 – j4, -4 – j9.7}. Using DIF FFT radix -2 algorithm. Use butterfly diagram. **(08 Marks)**

OR

6 a. Derive Goertzel algorithm to compute N-point DFT of an N-point sequence. Provide the direct form – II structure of this algorithm. **(08 Marks)**

b. For sequence x(n) = (2, 0, 2, 0} determine x(2) using Goertzel algorithm. Assume initial conditions are zero. **(04 Marks)**

c. What is chirp signal? Mention the applications of chirp Z transform. **(04 Marks)**

Module-4

7 a. Design a Butterworth analog high pass filter to meet the following specifications: Maximum passband attenuation = 2dB, minimum stop band attenuation = 20dB, passband edge frequency = 200rad/sec, stop band edge frequency = 100 rad/sec. **(12 Marks)**

b. Obtain the direct form – I and direct form – II realization for the following system: $y(n) = 0.75y(n-1) - 0.125y(n-2) + 6x(n) + 7x(n-1) + x(n-2)$ **(04 Marks)**

OR

8 a. Design a butterworth low pass filter using the bilinear transformation for the following specification: $0.8 \le |H(e^{jw})| \le 1$ for $0 \le w \le 0.2\pi$

$|H(e^{jw})| \le 0$ for $0.6\pi \le w \le \pi$

Assume T = 2 **(10 Marks)**

b. Obtain the parallel realization of the system function

$$H(z) = \frac{1 + \frac{1}{3}z^{-1}}{1 - \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2}}$$ **(06 Marks)**

Module-5

9 a. Determine the transfer function H(z) of an FIR filter to implement $h(n) = \delta(n) + 2\,\delta(n-1) + \delta(n-2)$, Using frequency sampling technique. **(08 Marks)**

b. Develop the lattice structure for the difference equation

$$y(n) = x(n) + \frac{2}{5}x(n-1) + \frac{3}{4}x(n-2) + \frac{1}{3}x(n-3)$$ **(08 Marks)**

OR

10 a. Realize FIR linear phase filter for N, even. **(08 Marks)**

b. Design FIR low pass filter for the frequency response

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

Use Hamming window to determine filter coefficient and frequency response. Take M = 5. **(08 Marks)**

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15EC53

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Explain the advantages of HDL's over schematic-based design. **(06 Marks)**

b. Explain top-down design methodology and bottom-up design methodology. **(10 Marks)**

OR

2 a. Discuss the trends in HDLs. **(06 Marks)**

b. Explain the design hierarchy using 4-bit ripple carry counter. **(10 Marks)**

Module-2

3 a. Explain the following data types with an example in verilog:
i) Vectors ii) Registers iii) Time iv) Real. **(08 Marks)**

b. What are system tasks and compiler directives? Explain. **(08 Marks)**

OR

4 a. What are the components of SR-latch? Write verilog HDL module of SR-latch. **(08 Marks)**

b. With an example, explain Hierarchical names. **(08 Marks)**

Module-3

5 a. With the help of logic diagram, write a verilog code for 4 to 1 multiplexer using gate – level modeling. **(08 Marks)**

b. What are rise, fall and turn-off delays? Explain, how they are specified in verilog. **(08 Marks)**

OR

6 a. Explain conditional and concatenation operator with an example. **(06 Marks)**

b. Write a verilog dataflow description for 4-bit full adder with carry lookahead. **(10 Marks)**

Module-4

7 a. Explain briefly event based timing control in verilog. **(08 Marks)**

b. Explain sequential and parallel blocks of verilog HDL. **(08 Marks)**

OR

8 a. Write a verilog HDL code for JK flip-flop using case statement. **(08 Marks)**

b. With syntax, explain conditional and branching loop statements in verilog HDL. **(08 Marks)**

Module-5

9 a. Explain the advantages and benefits of VHDL. **(06 Marks)**

b. Write a VHDL code for full-adder using two half adder in mixed style description. **(10 Marks)**

OR

10 a. Explain the synthesis process with a block diagram. **(10 Marks)**

b. Differentiate between signal assignment and variable assignment. **(06 Marks)**

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15EC54

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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 entropy and list the properties of entropy. **(04 Marks)**

b. Consider a zero memory source emitting three symbols s_1, s_2 and s_3 with respective probabilities 0.5, 0.3 and 0.2. Calculate: i) Entropy of the source ii) All symbols and the corresponding probabilities of the second order extension. Also, find entropy of extended source iii) Show that $H(s^2) = 2H(s)$. **(08 Marks)**

c. Show that 1 Nat = 1.443 bits. **(04 Marks)**

OR

2 a. Define Markoff source. Explain with typical transition state diagram. **(06 Marks)**

b. For the Markoff source shown in Fig.Q.2(b), find

i) State probabilities

ii) State entropies

iii) Source entropy.

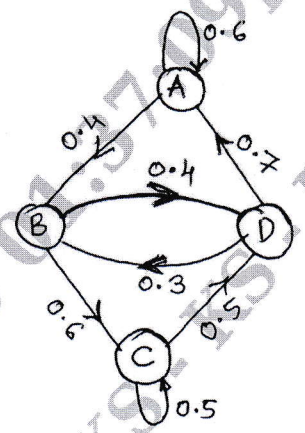

Fig.Q.2(b) **(10 Marks)**

Module-2

3 a. State and prove source coding theorem. **(08 Marks)**

b. Consider a discrete memoryless source with three symbols S = (X, Y, Z) with P = (0.5, 0.35, 0.15)

i) Use Shanon's first encoding technique and find the codewords for the symbols. Also, find the source efficiency and redundancy.

ii) Consider the second order extension of the source. Recompute the codewords, efficiency and redundancy. **(08 Marks)**

OR

4 a. Consider a discrete memoryless source with S = {A, B, C, D} with P = {0.4, 0.3, 0.2, 0.1}. Find the codeword using Huffman coding. Compute efficiency and variance. **(08 Marks)**

b. Write a note on LZ-Algorithm with an example. **(08 Marks)**

Module-3

5 a. Show that **(06 Marks)**

b. For the Joint Probability Matrix (JPM) given, find: i) H(X) ii) H(Y) iii) H(X, Y) iv) H(Y/X) and v) H(X/Y)

$$JPM = P(X,Y) = \begin{array}{c} \\ x_1 \\ x_2 \\ x_3 \\ x_4 \end{array}\begin{array}{c} \begin{array}{cccc} y_1 & y_2 & y_3 & y_4 \end{array} \\ \begin{bmatrix} 0.2 & 0 & 0 & 0.05 \\ 0 & 0.15 & 0.15 & 0 \\ 0 & 0 & 0.10 & 0.05 \\ 0.10 & 0.10 & 0 & 0.10 \end{bmatrix} \end{array}$$

(10 Marks)

OR

6 a. State and explain Muroga's theorem. **(04 Marks)**

b. Find the capacity of the channel for the channel matrix P(Y/X):

$$P(Y/X) = \begin{array}{c} \\ x_1 \\ x_2 \\ x_3 \end{array}\begin{array}{c} \begin{array}{ccc} y_1 & y_2 & y_3 \end{array} \\ \begin{bmatrix} 0.2 & 0.5 & 0.3 \\ 0.2 & 0.6 & 0.2 \\ 0.1 & 0.1 & 0.8 \end{bmatrix} \end{array}$$

(08 Marks)

c. Briefly explain Differential Entropy. **(04 Marks)**

Module-4

7 a. Briefly explain the need of parity/redundant bits in the data transmission. Also, explain how errors can be tackled using,
i) FEC (Forward Error Correction) ii) ARQ codes (Automatic Repeat Request Codes). **(06 Marks)**

b. Consider a (6, 3) Linear Block Code (LBC) with generator matrix

$$G = \begin{bmatrix} 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$$

Find:
i) All codewords
ii) All Hamming weights
iii) Minimum Hamming weight and distance
iv) Parity Check Matrix (PCM)
v) Draw the encoder circuit. **(10 Marks)**

OR

8 a. Explain the syndrome calculation and error detection with the help of neat circuit diagram for cyclic codes. **(06 Marks)**

b. Consider a (15, 7) binary cyclic code with $g(x) = 1 + x^4 + x^6 + x^7 + x^8$
i) Draw the encoder circuit
ii) Obtain the codeword for the input (00111)
iii) Draw the syndrome calculating circuit. **(10 Marks)**

Module-5

9 a. Briefly explain: i) Golay codes ii) BCH codes. **(06 Marks)**

b. Consider the convolution encoder shown in Fig.Q.9(b).

i) Write the impulse response of the encoder.

ii) Find the output for the message (10011) using time-domain approach.

iii) Find the output for the message (10011) using transform domain approach.

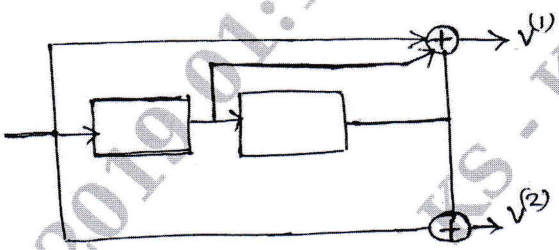

Fig.Q.9(b) **(10 Marks)**

OR

10 a. Explain various ways to represent convolution codes. **(06 Marks)**

b. For the convolution encoder $g^{(1)} = 110$, $g^{(2)} = 101$, $g^{(3)} = 111$

i) Draw the encoder block diagram for (3, 1, 2) convolution code

ii) Find generator matrix

iii) Find codewords corresponding to information sequence 11101 using time domain and transform domain approach. **(10 Marks)**

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15EC553

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

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define operating system. Explain goals and operation of an operating system. (10 Marks)
b. Explain different computational structures in an operating system. (06 Marks)

OR

2 a. Briefly explain the different classes of operating system, specifying the primary concern and key concepts used. (10 Marks)
b. In MPOS I/O bound programs should given higher priority than CPU bound programs justify with timing diagram. (06 Marks)

Module-2

3 a. Define process control block, explain its content. (08 Marks)
b. What is a thread? Compare kernel and user level thread. (08 Marks)

OR

4 a. Compare non preemptive and preemptive scheduling. (08 Marks)
b. With neat block diagram explain scheduling in a time sharing system. (08 Marks)

Module-3

5 a. Describe fixed and variable partitioned contiguous memory allocation schemer along with their merits and demerits. (08 Marks)
b. Explain the non contiguous allocation method. (08 Marks)

OR

6 a. Explain the data structure in Virtual Memory (VM) handler. (08 Marks)
b. For the following page reference string calculate the number of page faults with FIFO when
i) Number of page frames are three
ii) Number of page frames are four
Page reference string : 5 4 3 2 1 4 3 5 4 3 2 1 5. (08 Marks)

Module-4

7 a. With a neat diagram, explain the facilities provided by file system and IOCS layers. (08 Marks)
b. Explain the different operations performed on files. (08 Marks)

OR

8 a. Discuss methods of allocation of disk space with block representation. (08 Marks)
b. Explain implementation of file access to open a file. (08 Marks)

Module-5

9 a. Explain implementation of message passing in detail. (08 Marks)
b. Explain the interposes communication in UNIX by pipe, message queue and socket technique. (08 Marks)

OR

10 a. What is dead lock? Explain dead locks in resource allocation. (08 Marks)
b. Explain dead lock detection algorithm. (08 Marks)

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15EC562

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Explain the structure of C++ program. List the applications of C++. **(08 Marks)**

b. How dynamic memory allocation and freeing the memory performed with the help of new and delete operators? Explain with suitable examples. **(08 Marks)**

OR

2 a. What is reference variable in C++? Explain with suitable program. **(06 Marks)**

b. Describe, with examples, the uses of enumeration data types and also mention differences in the implementation of enum data type in ANSI C and C++. **(06 Marks)**

c. Explain selection control structure statements of C++. **(04 Marks)**

Module-2

3 a. Define recursion? Write a C++ program to calculate factorial of a given number using recursive function. **(06 Marks)**

b. What are the parameter techniques supported by C++? Explain the call by reference with reference arguments with swaping of two integer program. **(05 Marks)**

c. What is a class? Explain the class specification with an example. **(05 Marks)**

OR

4 a. What is an object? List the salient features of an object. **(03 Marks)**

b. What are access specifiers? How many access specifiers are used in C++? Explain with examples. **(06 Marks)**

c. What is a friend function? What are the characteristics of friend function, explain with an example program. **(07 Marks)**

Module-3

5 a. Define constructor? What are the characteristics of constructor, explain with an example program. **(08 Marks)**

b. What is operator overloading? What are the steps involving in operator overloading, write a C++ program to add two complex numbers by overloading '+' operator. **(08 Marks)**

OR

6 a. Define destructor? What are the characteristics of destructors? Explain with an example program. **(07 Marks)**

b. Mention the operators that cannot overloaded in C++. **(02 Marks)**

c. Explain the overloading of unary operators with an example program. **(07 Marks)**

Module-4

7 a. What is inheritance? Explain the different types of inheritance and syntax of defining derived classes. **(07 Marks)**

b. What is virtual function? What are the rules for virtual functions? **(05 Marks)**

c. Define pure virtual function. Explain the pure virtual function with an example program. **(04 Marks)**

OR

8 a. Explain the single inheritance with an example program. **(08 Marks)**

b. Explain the concept of polymorphism is incorporated in C++, explain with an example. **(08 Marks)**

Module-5

9 a. What is Stream? List and explain the classes used for console I/O stream operations. **(05 Marks)**

b. Explain the ios class functions and flags used for formatting output. **(05 Marks)**

c. Write a program in C++ to copy content of one file into another file until end of file is reached display the copied content on the output screen. **(06 Marks)**

OR

10 a. Describe the various clsses available for file operations. **(06 Marks)**

b. Explain how while (fin) statement detects the end of a file that is connected to fin stream. **(03 Marks)**

c. Explain opening a file with constructor function and opening a file with open ( ) function with suitable examples. **(07 Marks)**

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15EC563

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Compare microprocessor and microcontroller. **(04 Marks)**
b. Explain the internal organization of 8051 microcontroller RAM. **(04 Marks)**
c. Write the block diagram of 8051 and explain its features. **(08 Marks)**

OR

2 a. Write bit pattern of PSW register and explain the conditional flags present in PSW. **(04 Marks)**
b. How many SFR's present in 8051 and write the bit addressable SFR's present in 8051 with its address. **(04 Marks)**
c. Explain how 4K × 8 bit RAM and 8K × 8 EPROM can be interfaced to 8051 with necessary control signal. **(08 Marks)**

Module-2

3 a. Write the any four addressing modes percent 8051 and explain each one of them with an example. **(08 Marks)**
b. Write a program to add the BCD numbers 99 and 85 present in RAM address 32 and 33. Store the BCD result in memory location 34 and 35. Also show how the BCD instruction works. **(08 Marks)**

OR

4 a. Explain how MUL and DIV instruction works with an example in 8051 microcontroller. **(08 Marks)**
b. Find the time required to execute the following instructions if AT 89C51 microcontroller is used :
i) ADDCA,#54 if XTAL frequency is 12MHz
ii) XRL 35, # 47h if XTAL frequency is 11.0592
iii) MULAB if XTAL frequency is 12 MHz
iv) NOP if XTAL frequency is 11.0592MHz. **(04 Marks)**
c. Explain how the following instructions works with an example.
i) MOUX A, @ DPTR
ii) MOVC A, @A + PC. **(04 Marks)**

Module-3

5 a. What is stack and explain push and pop instruction works with an example. **(06 Marks)**

b. Calculate the delay produced in the program shown and XTAL used is of value 11.0592 MHz

```
          MOUR2, #250
    100P NOP
          NOP
          NOP
          NOP
          DJN2 R2, 100P
          RET.
```

(05 Marks)

c. Write an ALP to read the number from P1 if it is odd find the compliment of the number and send it though P2 otherwise send it through P3. **(05 Marks)**

OR

6 a. Write an ALP to read the status of witch S connected to P1.2 if it is in the on condition switch on the LED connected P2.2 otherwise off LED connected P2.2. **(06 Marks)**

b. What is subroutine and mention the advantages of subroutine. **(05 Marks)**

c. Use subroutine to find the factorial of a number stored in memory location 45. Assume that the number stored in memory location is ≤ 05. **(05 Marks)**

Module-4

7 a. Explain TMOD and SCON register with its bit pattern. **(05 Marks)**

b. Write the steps to be followed for using timer1 in mode 2 and also find the value to be stored in reg.THI and get a delay of 100 µS when XTAL frequency is 11.0592MHz. **(05 Marks)**

c. Using time 0 write a program to generate a square wave on P1.4 of frequency of 2KHz in model. Assume XTAL frequency is 11.592MHz. **(06 Marks)**

OR

8 a. What are advantages of serial communication over parallel communication? **(05 Marks)**

b. Write a program to transfer the message 'HELLO' serially at 4800 baudrate with 1 stop bit. **(05 Marks)**

c. Write a C program for 8051 to transfer the letter 'V' serially at 9600 baud continuously use 8 bit data and 1 stop bit. **(06 Marks)**

Module-5

9 a. Explain the bit pattern of IE registrar and how (i) to enable the serial interrupt, time r0 interrupt and external hardware interrupt in 8051. **(04 Marks)**

b. Write a ALP that continuously gets 8 bit data from P0 and sends it to P1 while simultaneously creating a square wave of 200µs on pin 2.1 use timer 0 to create a square wave and XTAL frequency is 11.592MHz. **(06 Marks)**

c. Explain how TCON can be used in handling the interrupts and also indicate its bit pattern. **(06 Marks)**

OR

10 a. Write the name of the interrupt present in 8051 and also indicate the starting address reserved in ROM for each interrupt. **(05 Marks)**

b. Write a ALP to switch on LED connected on P1.3 for 500µsec when INT1 is activated. XTAL used 12MHz. **(06 Marks)**

c. Name the 14 pins present in LCD and show how it can be interfaced to microcontroller 8051 with P1 connected to data lines. **(05 Marks)**

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