

- i. Answer **SIX** questions, taking any **THREE** from each section.
- ii. All questions are equal values
- iii. Use **separate answer script** for each section

SECTION-A

- | | | |
|----|---|------|
| 1. | a) What is machine learning? Discuss different categories of machine learning task. | 5 |
| | b) What is conditional probability? When two events are independents? | 3.67 |
| | c) What are supervised and unsupervised learning? | 3 |
| 2. | a) What is Decision Tree? Show decision tree mechanism for playing tic-tac-toe? | 3 |
| | b) How many nodes are created in a decision tree of a chess game? How can you optimize your solution? | 4.67 |
| | c) What do you mean by SVM | 4 |
| 3. | a) Draw the model of Artificial Neural Network and describe it. | 3.67 |
| | b) How back propagation work in an ANN show it with AND gate Logic. | 4 |
| | c) Why multi-layer learning is better than two layer learning in ANN. | 4 |
| 4. | a) What do you mean by conditional probability? How Bayes probability can be used as classification? | 2 |
| | b) Describe K-Nearest Neighbor method? | 3.67 |
| | c) What do you mean by learning theory? why learning theory is needed? | 6 |

SECTION-B

- | | | |
|----|--|------|
| 5 | a) What do you understand by Hidden Markov Model? How it works? | 5 |
| | b) Derive back propagation rule. | 5 |
| | c) What is stability? Explain briefly. | 1.67 |
| 6. | a) What do you mean by rule based learning. | 4 |
| | b) Give example of rule based learning for human relations. | 4 |
| | c) When rule based learning is supervised and unsupervised give example? | 3.67 |
| 7. | a) What do you mean by sample dimension? How reduce dimension of sample? | 3.67 |
| | b) Describe application of machine learning. | 4 |
| | c) Describe concept of machine learning system. | 4 |
| 8 | a) Describe reinforcement Learning. | 4 |
| | b) What do you mean by rule engine? How rule engine works. | 4 |
| | c) What do you mean by genetic algorithm. How it works? | 3.67 |

Bangabandhu Sheikh Mujibur Rahman Science and Technology University, Gopalganj
 Department of computer Science & Engineering
 4th Year 1st Semester B.Sc. Engg. Examination-2015
 Course No.: CSE410 Course Name: Digital Signal Processing

Full Marks: 70

Times: 4 Hours

N.B.:

- i. Answer SIX questions, taking any THREE from each section.
- ii. All questions are of equal values
- iii. Use separate answer script for each section.

Section A

- | | | |
|----|---|------|
| 1. | a) What do you understand by signal, system and digital signal processing? | 3 |
| | b) What is continuous and discrete time signal? Give the classification of signals? | 2.67 |
| | c) Discuss the properties by which the discrete-time sinusoids can be characterized. | 3 |
| | d) Write the advantages and limitations of DSP. | 3 |
| 2. | a) What is sampling? | 1 |
| | b) Consider the analog signal $x_a(t)=3\cos 100\pi t$ <ul style="list-style-type: none"> (i) Determine the minimum sampling rate required to avoid aliasing. (ii) Suppose that the signal is sampled at the rate $F_s=200\text{Hz}$. What is the discrete-time signal obtained after sampling? | 2.67 |
| | c) Discuss the basic set of operation on signal. | 5 |
| | d) Check for following systems are linear, causal, time invariant, stable, static <ul style="list-style-type: none"> (i) $y(n)=x(2n)$ (ii) $y(n)=\cos(x(n))$ | 3 |
| 3. | a) What are causal and non-causal systems? | 2 |
| | b) Discuss the different types of signal representation. | 3.67 |
| | c) What is correlation? Distinguish between cross-correlation and autocorrelation. | 3 |
| | d) Find the convolution of the following sequence $x(n)=(1, 2, -1, 1)$, $h(n)=(1, 0, 1, 1)$. | 3 |
| 4. | a) Define the z-transform. | 1 |
| | b) What is Region of convergence? State the properties of Region of convergence | 4 |
| | c) Explain the time reversal property of z-transform. | 3 |
| | d) Find the Z transform of <ul style="list-style-type: none"> (i) $x(n)=[(1/2)n - (1/4)n] u(n)$ (ii) $x(n)=n(-1)^n u(n)$ | 3.67 |

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Section- A

- | | |
|--|------|
| 1. a) What do you understand by data communications? What are the characteristics of data communications? | 3 |
| b) What is the difference between half-duplex and full duplex transmission modes? | 2 |
| c) Describe the components of data communications system. | 4 |
| d) When a party makes a local telephone call to another party, is this a point-to-point or multipoint connection? Explain your answer. | 2.67 |
| | |
| 2. a) What is frequency modulation? Classify it. | 3 |
| b) How does FDM combine multiple signals into one? | 3.67 |
| c) Distinguish between baseband transmission and broadband transmission. | 3 |
| d) When the signal is 20V, the noise is 6mV. What is the maximum data rate supported by this telephone line? | 2 |
| | |
| 3. a) What does the amplitude, frequency and phase of a signal measure? | 3 |
| b) What is the theoretical capacity of a channel in each of the following cases. | 3 |
| i. Bandwidth: 20 kHz $\text{SNR}_{\text{dB}} = 40$ | |
| ii. Bandwidth: 200 kHz $\text{SNR}_{\text{dB}} = 6$ | |
| c) What is Nyquist theorem? Explain briefly. | 3 |
| d) Distinguish bit stuffing and byte stuffing | 2.67 |
| | |
| 4. a) What is bit padding in TDM process? Compare it with framing bits. | 5 |
| b) What is the relationship between the number of slots in a frame and the number of inputs lines for TDM? Explain. | 4 |
| c) Why FM is superior to AM? | 2.67 |

Section - B

- | | |
|--|------|
| 5. a) What are the differences between data element and signal element? | 2 |
| b) Discuss different kinds of line coding schemes. | 5 |
| c) We have sampled a low pass signal with a bandwidth of 300 kHz using 1024 levels of quantization. | 3 |
| i. Calculate the bit rate of the digitized signal. | |
| ii. Calculate SNR_{dB} for this signal. | |
| iii. Calculate the PCM bandwidth of this signal. | |
| d) List three techniques of digital-to-digital conversion. | 1.67 |
| | |
| 6. a) Which characteristics of an analog signal are changes to represent the digital signal in each of the following digital to analog conversion? | 6 |
| i. ASK ii. FSK iii. PSK iv. QAM | |
| b) An analog signal has a bit rate of 8000 bps and a baud rate of 1000 baud. How many data elements are carried by each signal element? How many signal elements do we need? | 3 |

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Section A

- | | | |
|----|--|------|
| 1. | a) Define simulation. Explain when simulation is the appropriate tool and when it is not ? | 5 |
| | b) Draw a control flow diagram which shows the steps in simulation modeling. | 3 |
| | c) Define state, event, endogenous and exogenous. | 3.67 |
| 2. | a) Define discrete and continuous systems. | 2 |
| | b) What is model? Discuss different types of model. | 4 |
| | c) Explain a “Chemical Reactor Plant” as an example of a continuous system simulation with flowchart. | 5.67 |
| 3. | a) What do you understand by cumulative distribution function? | 2 |
| | b) Distinguish between Bernoulli and Binomial distribution. | 3 |
| | c) A production process manufacturers computer chips on the average at 2% nonconforming. Every day, a random sample of size 50 is taken from the process. If the sample contains more than two nonconforming chips, the process will be stopped. Compute the probability that the process is stopped by the sampling scheme. | 3.67 |
| | d) Explain “Poisson distribution” as a statistical model in simulation. | 3 |
| 4. | a) Use the mixed congruential method to generate a sequence of three two-digit random numbers with $X_0 = 37$, $a = 7$, $c = 29$, and $m = 100$. | 4 |
| | b) Use the linear congruential method to generate a sequence of random numbers with: $X_0 = 27$, $a = 17$, $c = 43$, and $m = 100$. Here, the integer values generated will all be between zero and 99 because of the value of the modulus. | 4 |
| | c) The sequence of numbers 0.54, 0.73, 0.98, 0.11, and 0.68 has been generated. Use the Kolmogorov-Smirnov test with $\alpha = 0.05$ to learn whether the hypothesis that the numbers are uniformly distributed on the interval [0, 1] can be rejected. | 3.67 |

Bangabandhu Sheikh Mujibur Rahman Science and Technology University

Department of Computer Science and Engineering

4th Year 1st Semester BSc Engineering Examination-2015

Course No. : CSE 412

Full Marks: 70

Course Name: Communication Engineering

Times: 4 Hours

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c) How are QAM related to ASK and PSK? Draw the constellation diagram for the following:	2.67
i. 16 QAM , 3 amplitudes, 12 phase	
ii. 16 QAM , 4 amplitudes, 8 phase	
7. a) Discuss different kind of analog to analog conversion.	4
b) Four channels, two with a bit rate of 300 kbps and two with a bit rate of 250 kbps, are to be multiplexed using multiple slot TDM with no synchronization bits. Answer the following questions.	4
i. What is the size of a frame in bits?	
ii. What is the frame rate?	
iii. What is the duration of a trame?	
iv. What is the data rate?	
c) Describe multilevel TDM, multiple slot TDM and pulse stuff TDM.	3.67
8. a) What is the purpose of the Hamming code? How can we use the Hamming code to correct a burst error?	3.67
b) Draw a QAM Modulator and Demodulator.	3
c) What is checksum? Describe the process of checksum. What kind of error is undetectable by the checksum?	5

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Section B

- | | | |
|----|--|------|
| 5. | a) What is meant by spline curve? Discuss different types of spline curve. | 2.6 |
| | b) Derive the expression for the Hermit blending functions to generate spline curve. | 5 |
| | c) Explain Octree with figure. | 4 |
| 6. | a) What is fractal object? What are its characteristics? | 2 |
| | b) Define Self-similar and Self-affine fractals. | 2 |
| | c) What is fractal dimension? Show that $D = \frac{\ln(n)}{\ln(\frac{1}{s})}$, Where D is the fractal dimension, n is the number of sub parts and s is the scaling factors. | 3.67 |
| | d) Explain the random midpoint displacement method for constructing fractal object. | 4 |
| 7. | a) Define verification and validation of simulation model. | 2 |
| | b) Draw the flowchart of model building, verification, and validation. | 3 |
| | c) "Calibration is the iterative process of comparing the model to the real system" – Explain it. | 4 |
| | d) Which suggestions might enhance and facilitate data collection? | 2.67 |
| 8. | a) What is SIMSCRIPT? | 1 |
| | b) Explain key elements of SIMSCRIPT. | 4.67 |
| | c) What are the SIMSCRIPT syntax rules? Discuss with some examples. | 3 |
| | d) Describe the program structure of a SIMSCRIPT program. | 3 |

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SECTION - A

- | | |
|---|----------------|
| 1. (a) Explain advantages and disadvantages of parallel processing. | 3 |
| (b) Discuss the classification of parallel computers. | $4\frac{2}{3}$ |
| (c) Dr. John Wrolton of the United States Los Alamos Scientific Laboratory said once: "The designers of supercomputers will do better at exploiting concurrency in the computing problems if they use a small number of fast processors instead a large number of slower processors." Derive the equation of average speedup of parallel computers and explain the above statement. | 4 |
| 2. (a) List five parallel programming models. Explain data parallel model. | 4 |
| (b) How will you understand a problem can be solved in parallel? Discuss it with an example. | 4 |
| (c) What is Granularity? Explain the effect of granularity on parallel processing. | $3\frac{2}{3}$ |
| 3. (a) What are the factors of pipelining that limit its performance? Explain the case of conditional branching. | $5\frac{2}{3}$ |
| (b) Derive the equation of speed-up factor for the instruction pipelining. | 3 |
| (c) What are the pipelining hazards? Explain resource hazard. | 3 |
| 4. (a) Classify and define various pipelining processors. | 4 |
| (b) Compare the advantages and disadvantages of the three interleaved memory organizations: the S-access, the C-access, and the C/S-access for pipelined vector accessing. In the comparison, you should be concerned with the issues on effective memory bandwidth, storage schemes used, access conflict resolution, and cost-effectiveness tradeoffs. | 4 |
| (c) Explain vector processing with an example. | $3\frac{2}{3}$ |

SECTION-B

- | | |
|--|---|
| 5. (a) Discuss briefly the key challenges that one needs to address in the design and development of distributed applications. | 4 |
|--|---|

- (b) What is heterogeneity of a distributed system? How can we solve this for the user? 3
- (c) A service is implemented by several servers. Explain why resources might be transferred between them. Would it be satisfactory for clients to multicast all requests to the group of servers as a way achieving mobility transparency for clients? $4\frac{2}{3}$
6. (a) Distinguish between client-server model and peer-to-peer model. $3\frac{2}{3}$
- (b) State synchronous and asynchronous distributed systems. What are their main features and what are the consequences of these features? 5
- (c) What kind of faults can occur in distributed systems and what are their effects? 3
7. (a) Remote Method Invocation: trace the way of a request and of the reply from the client to a remote server and back. Illustrate with a figure. 5
- (b) Explain the situations when a server in a distributed system can crash. How you will handle these? 4
- (c) Describe the distributed memory system. $2\frac{2}{3}$
8. (a) What is cloud computing? What are the advantages of cloud computing? $3\frac{2}{3}$
- (b) What is an Interface Definition Language? What is its function in the context of Middleware? 4
- (c) Static and dynamic invocation in CORBA: How do they work? Compare. 4