

Bangabandhu Sheikh Mujibur Rahman Science and Technology University

Department of Computer Science & Engineering

2nd Year 2nd Semester B.Sc. Engineering Final Examination-2016

Course Title: Cyber and Intellectual Property Law
Full Marks: 60

Course No: LAW 254
Time: 3 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 is E-governance? What are the purposes of E-governance? Discuss. | 5 |
| (b) State the barrier of E-governance in Bangladesh. | 5 |
| 2. (a) What do you mean by legal recognition of digital signature? Discuss. | 5 |
| (b) What is meant by online contract? Discuss the evidentiary value of online contracts? | 5 |
| 3. (a) What is Macro, Trojan horse, Worm, Memory residential and Hox virus? Discuss. | 5 |
| (b) Briefly discuss the methods, advantages and disadvantages of E-learning? | 5 |
| 4. (a) How cyber crimes originated? Discover the methods of prevention of cyber crimes. | 4 |
| (b) Define broadcasting and harmful interference. Abdullah causes annoyance to Sajia over phone to make a relation with her. He repeatedly does it. He sends obscene message to Sajia which goes against the modesty of her. Are those activities crime? Discuss with relevant section. | 6 |

SECTION-B

- | | |
|---|---|
| 5. (a) What is intellectual property? How does it differ from other kinds of property? | 5 |
| (b) Write the object of intellectual property law. Which remedies are available in case of violation of intellectual property right? Discuss. | 5 |
| 6. (a) Define the term "Copyright". What rights are protected under copyright? Discuss. | 5 |
| (b) Write the grounds and exceptions of infringement of copyright. State the remedies in these issues. | 5 |
| 7. (a) What are the characteristics of good trademarks? Which marks are not registrable? | 5 |
| (b) What are the process to register a trade mark? Explain elaborately. | 5 |
| 8. (a) What is patent right? What are the conditions of patentability? Discuss briefly. | 5 |
| (b) Which discover cannot consider as subject matter of patent right? What would be the procedure of application of patent under "Patent and Design Act, 2001"? | 5 |

Bangabandhu Sheikh Mujibur Rahman Science and Technology University

Department of Computer Science & Engineering

2nd Year 2nd Semester B.Sc. Engineering Final Examination-2016

Course Title: Numerical Analysis and Concrete Mathematics
Full Marks: 60

Course No: CSE262
Time: 3 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 are the reasons for occurring errors in numerical analysis? 3
 (b) Illustrate truncation, rounding-off and algorithmic error. 3
 (c) Using Bisection method, find a positive root of the equation: $\cos x - 1.3x = 0$. 4
2. (a) Describe the approach of False position method for finding roots. 3
 (b) Find the root of the following equation using bisection method: $x^2 - 4x - 10 = 0$. 5
 (c) Write down the difference between Bisection method and False position method. 2
3. (a) What do you mean by interpolation and interpolation polynomials? Also describe about regression. 1+1
 (b) What do you mean by Linear interpolation? How does Lagrange interpolation differ from linear interpolation? 1+1
 (c) Using Lagrange interpolation find the value of $f(x)$ for the point $x = 3.5$ according to the tabular value: 6

x	1	2	3	4	5
$f(x)$	1	1.4142	1.7321	2	2.2361

4. (a) What do you mean by Least Square regression? Give description about it. 2
 (b) Write down the formula for calculating a and b in this equation $y = a + bx$. 2
 (c) Apply Least square regression to find the value of y for $x = 8$: 6

x	1	2	3	4	5	6	7
y	3	4	4	5	8	9	10

SECTION-B

5. (a) Write down the approach of Gauss Elimination method for finding the inverse of a 3×3 matrix. 4
 (b) Find the inverse of the following matrix using gauss Elimination method: 6

$$\begin{matrix} 2 & 1 & 1 \\ 3 & 2 & 3 \\ 1 & 4 & 9 \end{matrix}$$
6. (a) What do you mean by Numerical Integration? 1
 (b) Describe the General Quadrature formula for numerical integration. 3
 (c) Evaluate $\int_0^{10} \frac{dx}{1+x^2}$ by using 3*2
 (i) Trapezoidal rule
 (ii) Simpsons 1/3 rule
 (iii) Simpsons 3/8 rule = 6

7. (a) Describe the Euler's method for differential equation to derive the formula: 3

$$y_{m+1} = y_m + hf(x_m, y_m)$$
- (b) What is Runge-Kutta method? Write down its first order and third order derivations. 1+2
- (c) Given that $y' = x^2 - y$, $y(0) = 1$, find $y(0.1)$, $y(0.2)$ using Runge-Kutta methods of 4
 - (i) Second Order

$$\begin{aligned} k_1 &= hf(x_0, y_0) \\ k_2 &= hf(x_0 + h, y_0 + k_1) \\ k &= \frac{1}{2}(k_1 + k_2) \\ y_1 &= y_0 + k \end{aligned}$$

8. (a) Why Weddle's rule gives better result in numerical integration? 4
 (b) By means Newton's dividend difference formula, find the values of $f(8)$ and $f(15)$ form the following table: 6

X:	4	5	7	10	11	13
$f(X)$:	48	100	294	900	1210	2028

1/2

Bangabandhu Sheikh Mujibur Rahman Science and Technology University

Department of Computer Science & Engineering

2nd Year 2nd Semester B.Sc. Engineering Final Examination-2016

Course Title: Digital Logic Design

Full Marks: 60

Course No: CSE 252

Time: 3 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 is Karnaugh map? Give an example of two and three variables map. 1+2
(b) Simplify the Boolean function: $F = x'yz + x'yz' + xy'z' + xy'z$. 2
(c) Simplify the following Boolean function in (a) sum of products and (b) product of sums. 5
$$F(A, B, C, D) = \sum(0, 1, 2, 5, 8, 9, 10)$$
 with proper gate implementation.
2. (a) Implement the function $F(x, y, z) = \sum(0, 6)$ with NAND gates. 3
(b) What is Don't care condition? Explain it with an example. 1+1
(c) Simplify the Boolean function: $F(w, x, y, z) = \sum(1, 3, 7, 11, 15)$ and the don't care conditions: 5
$$d(w, x, y, z) = \sum(0, 2, 5)$$
.
3. (a) What is a combinational logic circuit? Draw its block diagram. 1+1
(b) Write down the design procedures of combinational circuits. 2
(c) What is code conversion? Design a BCD-to-7-segment code converter. 1+5
4. (a) What is Universal gate? Implement NOT, AND and OR gates by NAND gates. 1+2
(b) Suppose you are in a class room where there are eight windows. Your teacher gives you an assignment to open and close the window one after another and so forth. How can you design a digital circuit for this problem? 4
(c) Analyze the gate diagram truth table for the following expressions: 3
$$T_1 = (CD)', T_2 = (BC)', T_3 = (B'T_1)', T_4 = (AT_3)', F = (T_2T_4)'$$

SECTION-B

5. (a) What is Multiplexer? Explain a 4-to-1 line multiplexer. 1+3
(b) What is ROM? Design a 32×4 ROM. 1+3
(c) What is Encoder? Give an example. 2
6. (a) Explain sequential circuit with corresponding block diagram. 2
(b) Explain D Flip-Flop in details with proper logic diagram, characteristic table and equations. 5
(c) Design a synchronous counter using J-K flip-flop to count the following sequence: 3
$$0 \rightarrow 2 \rightarrow 4 \rightarrow 5 \rightarrow 1 \rightarrow 7 \rightarrow 6$$
7. (a) What is Decoder? Explain a 3-to-8 line decoder. 1+3
(b) Implement a full adder circuit with a decoder and two OR gates where the combinational circuit in sum of minterms are: $S(x, y, z) = \sum(1, 2, 4, 7)$ and $C(x, y, z) = \sum(3, 5, 6, 7)$. 3
(c) Draw the Karnaugh map for the corresponding expression for Sum of products (SOP): 3
$$A \oplus B \oplus C \oplus D$$
8. (a) Why are Master-Slave J-K flip-flops used? Explain with example. 3
(b) What do you mean by sequential circuit? Explain Moore and Mealy model. 4
(c) Draw the odd-parity generation table and its figure. 3

Bangabandhu Sheikh Mujibur Rahman Science and Technology University

Department of computer Science & Engineering

2nd year 2nd Semester B.Sc. Engineering Final Examination-2016

Course Name: Design and Analysis of Algorithms

Full Marks: 60

Course No.: CSE 250

Times: 3 Hours

N.B.:

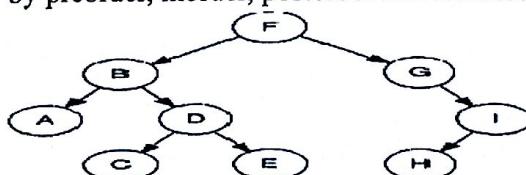
- Answer SIX questions, taking any THREE from each section.
- All questions are of equal values.
- Use separate answer script for each section.

SECTION-A

- a) What do you mean by algorithm? What are the criteria an algorithm must satisfy? 1+2
b) Write about best, average and worst case analysis with proper example. 4
c) What is asymptotic notation? Explain it with proper example. 3
- a) Distinguish between up-recursive and down-recursive with an example. 2
b) Consider the recurrence equation:
$$\begin{aligned} T(N) &= 1 && \text{for } N = 1 \\ T(N) &= 2T(N-1) + 1 && \text{for } N \geq 2 \end{aligned}$$
 Solve the recurrence equation by unfolding method.
c) Find the complexity of the given recurrence equation using master theorem: 4
$$T(n) = 2T(n/2) + n \log n.$$
- a) What do you know about optimal binary search tree? 2
b) Use Radix sort algorithm to sort the following data set. 4
329, 457, 657, 839, 436, 720, 35
c) Define Knapsack problem. Find an optimal solution to the Knapsack instance n=7, m=15, 4
 $w=[2,3,5,7,1,4,1]$, and $p=[10,5,15,7,6,18,3]$ using greedy method.
- a) Find out the optimal solutions using matrix chain multiplication. Where dimension of matrixes are: 5
 $A_1 = 10 \times 100$
 $A_2 = 100 \times 5$
 $A_3 = 5 \times 50$
 $A_4 = 50 \times 1$
b) Write down the algorithm of the quick sort. 5

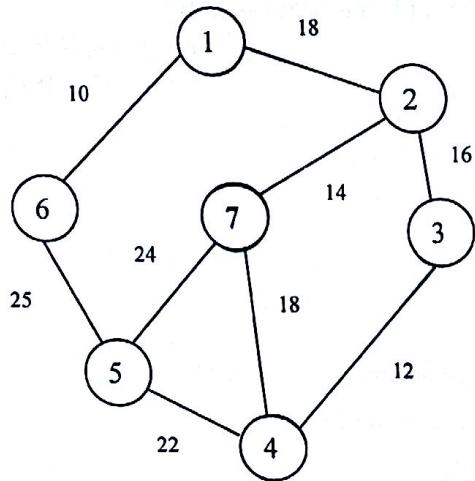
SECTION-B

- a) Explain some real world applications of greedy algorithm. 3
b) How will you calculate longest common subsequence? 3
c) Traverse the following tree by preorder, inorder, postorder and levelorder. 4

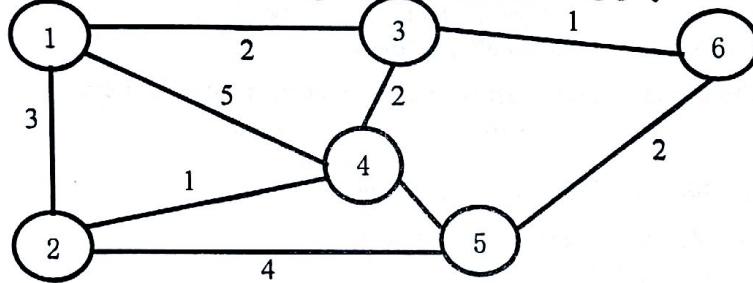


6. a) What are the four steps to develop a dynamic programming?
b) Find MST with minimum cost from the following graph using Prim's and Kruskal's algorithm:

7



7. a) What is a Minimum Spanning Tree? 1
b) Find out the shortest path using dijkstra's algorithm for the following graph: 5



- c) How will you find the closest pair of points? 4
8. a) Define: NP problem, NP-hard problem. 2
b) Discuss about branch and bound. 4
c) What are the rules followed in 15-puzzle problem? 4

Bangabandhu Sheikh Mujibur Rahman Science and Technology University

Department of Computer Science & Engineering

2nd Year 2nd Semester B.Sc. Engineering Final Examination-2016

Course Title: Automata Theory

Full Marks: 60

Course No: CSE 260

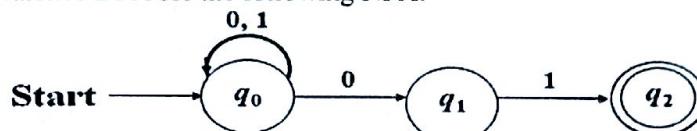
Time: 3 hours

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

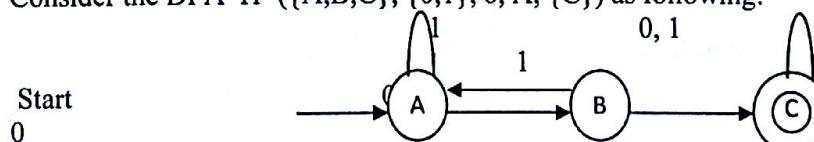
1. (a) What is Finite Automata? Write down its types. 1+1
(b) Give the definition of DFA and NFA addressing their tuples. 2+2
(c) Show the differences of DFA and NFA. 4
2. (a) How does a DFA process strings? 2
(b) Draw the transition diagram for the DFA that accepts the language $L = \{x01y | x \text{ and } y \text{ are any strings of 0's and 1's}\}$ 3
(c) Design an NFA accepting the following language $L = \{ w | w \in \{0, 1\}^* \text{ and second last position is 1} \}$ so that you can test this string $x = 01010$. 5
3. (a) What do mean by the equivalence of DFA and NFA? 2
(b) Construct the equivalence DFA for the following NFA. 6



- (c) Draw the diagram for the Finite Automata to recognize the key word "then". 2
4. (a) Describe the simple notations for DFA's with examples. 3
(b) Draw the DFA from the following transition table that accepts the strings over the binary alphabet and show the sequence of moves made for processing the input string 011101. 4

δ	0	1
$\rightarrow q_0$	q_1	q_1
q_1	q_4	q_2
$*q_2$	q_3	q_3
q_3	q_2	q_2
q_4	q_4	q_4

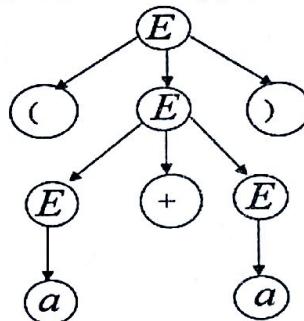
- (c) Consider the DFA $H = (\{A, B, C\}, \{0, 1\}, \delta, A, \{C\})$ as following: 3



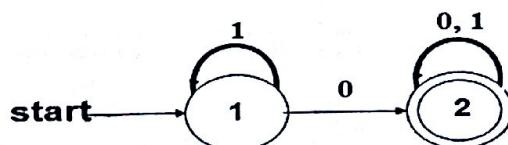
From the above DFA H , construct the transition table and show that the string 1101110001010 are accepted by this DFA H .

SECTION-B

5. (a) Write down the RE to represent the string **Computernetwork CN** and 2
csebsmrstu@bsmrstu.edu.
- (b) What are the uses of ϵ -transitions? Write down an ϵ - NFA that can accept the decimal numbers 1+3 like 2.15, 0.125, +1.4, -0.501.
- (c) Define CFG through its tuples. Write down the CFG for palindrome over the alphabet {0, 1}. 1+3
6. (a) What is recursive inference in CFG? Show the recursive inference of arrival in this $(x + y1)^* y$ 1+2 through its grammar.
- (b) What do you mean by left most (lm) and right most (rm) derivation? Write down the rm 2+3 derivation for $a^*(a+b)$ using the following grammar:
- $$\begin{aligned} E &\rightarrow E+E \mid E^*E \mid (E) \mid I \\ I &\rightarrow L \mid ID \mid IL \\ D &\rightarrow 1 \\ L &\rightarrow a \mid b \end{aligned}$$
- (c) Represent the string "the man sleeps" according to its grammar. 2
7. (a) What is parse tree? What is the yield of the following parse tree? 1+1



- (b) What do you mean by Ambiguity in CFG? Write down the two ambiguous derivations for the 4 expression $a+a^*a$ which is constructed from this grammar shown below:
- $$E \rightarrow E+E \mid E^*E \mid (E) \mid a$$
- (c) Remove the ambiguity from the following CFG: 4
- $$\begin{aligned} E &\rightarrow E+E \\ E &\rightarrow E^*E \\ E &\rightarrow (E) \\ E &\rightarrow b \end{aligned}$$
- Also draw its unique derivation.
8. (a) What is Regular Expression (RE)? Write down some applications of RE. 2
- (b) How can you build a Language L from RE through Basis and Induction rules? 3
- (c) Convert the following DFA to RE. 5



Bangabandhu Sheikh Mujibur Rahman Science and Technology University

Department of computer Science & Engineering

2nd year 2nd Semester B.Sc. Engineering Final Examination-2016

Course Name: Linear Algebra

Course No.: MAT 256

Full Marks: 60

Times: 3 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. Prove that W is a subspace of vector space $V(F)$ if and only if W is non empty and $\forall \alpha, \beta \in F$ 5 and $\forall u, v \in W \Rightarrow \alpha u + \beta v \in W$.
- b. Define vector space with example. Let $W = \left\{ \begin{vmatrix} a & b \\ c & d \end{vmatrix} : a + b + c + d = 0 \right\}$. If $V = \left\{ \begin{vmatrix} a & b \\ c & d \end{vmatrix} : a, b, c, d \in R \right\}$, 5 then show that W is a subspace of $V(R)$.
2. a. Define linear combination of a vector in a vector space. Express the vector $v = (1, 2, 6)$ as a linear 5 combination of the vectors $v_1 = (2, 1, 0)$, $v_2 = (1, -1, 2)$, $v_3 = (0, 3, -4)$.
- b. For which values of λ the following set of vectors are linearly dependent: 5
 $v_1 = \left(\lambda, -\frac{1}{2}, -\frac{1}{2} \right)$, $v_2 = \left(-\frac{1}{2}, \lambda, -\frac{1}{2} \right)$, $v_3 = \left(-\frac{1}{2}, -\frac{1}{2}, \lambda \right)$
3. a. Define basis of a vector space. Show that the set of vectors 5
 $(1, 2, 3, 4), (2, 1, -1, 3), (3, 3, 2, 7), (1, -1, -1, -1)$ do not form basis of R^4 .
- b. Find the basis and dimension of the sub space W generated by the polynomial $\{t^3 - 2t^2 + 4t + 1, 2t^3 - 3t^2 + 9t - 1, t^3 + 6t - 5, 2t^3 - 5t^2 + 7t + 5\}$. 5
4. a. Define linear transformation of a vector space. Show that the mapping $T: \mathbb{R}^3 \rightarrow \mathbb{R}^2$ defined by 5
 $T(x, y, z) = (2x + y + z, 3x + y + 4z)$ is a linear transformation.
- b. Let $T: \mathbb{R}^3 \rightarrow \mathbb{R}^4$ be a linear transformation, where $T(x, y, z) = (x + y + z, x + 2y - 3z, 2x + 3y - 2z, 3x + 4y - z)$, then find the Basis and dimension of (i) $\text{Im } T$ and (ii) $\text{Ker } T$. 5

SECTION-B

- 5 a. Define eigen values and eigen vectors of a square matrix. 2
- b. Find the eigen values and corresponding eigen vectors of the following matrix: 8

$$A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}$$

Also find the matrix P that diagonalizes the matrix A and determine $P^{-1}AP$.

6. a. Define Dual Basis. Let $B = \{(1, -1, 3), (0, 1, -1), (0, 3, -2)\}$ be a basis of the vector space \mathbb{R}^3 5 over the real field \mathbb{R} . Find the dual basis of B .
- b. Let $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ be a linear operator define by $T(x, y, z) = (2x - 3y + 4z, 5x - y - 2z, 4x + 7y)$. 5 Find the matrix of T in the basis $\{f_1 = (1, 1, 1), f_2 = (1, 1, 0), f_3 = (1, 0, 0)\}$
7. a. What do you mean by bilinear form? Let $x = (x_1, x_2)$ and $y = (y_1, y_2)$ be in \mathbb{R}^2 . Show that 5 $f(x_1, x_2) = 2x_1y_2 - 3x_2y_1$ is a bilinear form on \mathbb{R}^2 .
- b. Prove that the quadratic form $q(x_1, x_2, x_3) = x_1^2 + 2x_2^2 + 2x_3^2 - 2x_1x_2 - 2x_2x_3 + x_3x_1$ is positive 5 definite.
8. a. Define inner product space. If $\{v_1, v_2, \dots, v_n\}$ is an orthonormal basis for an inner product 5 space V and u is any vector in V , then prove that $u = \langle u, v_1 \rangle v_1 + \langle u, v_2 \rangle v_2 + \dots + \langle u, v_n \rangle v_n$.
- b. Use the Gram-Schmidt orthogonalization process to transform the basis $\{v_1, v_2, v_3\}$ of \mathbb{R}^3 into an 5 orthonormal basis, where $v_1 = (3, 0, 4)$, $v_2 = (-1, 0, 7)$, $v_3 = (2, 9, 11)$ and also verify the result.

Page 1 of 1