

Department of Computer Science & Engineering
1st Year 2nd Semester B.Sc. (Hons.) Midterm Examination-1, 2013

STAT-1224: Introduction to Statistics

Total Marks: 20

Time: 1.0 Hour

Answer all the questions

1. Define statistics. Discuss the scope of statistics. (3)
2. Over a 1-month period, 40 salespeople sold the following number of cars: (8)

7	8	5	10	9	10	5	12	8	6
10	11	6	5	10	11	10	5	9	13
8	12	8	8	10	15	7	6	8	8
5	6	9	7	14	8	7	5	5	14

 - a) Showing details of your calculation, organize the data into a frequency distribution.
 - b) Draw a histogram and a cumulative frequency polygon from the frequency distribution constructed in part (a)
3. What do you mean by central tendency? What are the different measures of central tendency? (3)
4. Refer to Question 2, find arithmetic mean from the frequency distribution constructed in part (a). (3)
5. Prove that the algebraic sum of the deviations of the values x_1, x_2, \dots, x_n from their arithmetic mean (\bar{x}) is zero. (3)

...Good Luck...

Class Test-1 of 1st Year 2nd Semester
Department of Computer Science & Engineering
University of Dhaka
Subject: Digital Systems
Marks: 25 **Time:** 60 Minutes
Date: 22/09/2013

Answer the following **questions:**

01. a) What is digital system? Mention the advantages of a digital system over an analog system. **02**
- b) What is the value of a binary with n bits all of which are 1s? **02**
- c) How many 1s are present in the binary representation of $15 \times 256 + 5 \times 16 + 3$? **02**
02. a) Realize an Ex-OR gate using only NOR gates. **03**
- b) Express the following given function in product of sums form
- $$F(x,y,z) = x'z' + y'z' + xy' \quad \mathbf{03}$$
- where ' denotes the complement symbol and + is the OR operation.
03. a) What is the logic which controls a staircase light associated with two switches A and B located at the bottom and top of the staircase, respectively. **03**
- b) What is the decimal code for the minterm of a four-variable function given by $w'x'yz$? **02**
04. Minimize the following Boolean expressions to the required number of literals: **(03 x 2)**
- a) $BC + AC' + AB + BCD$ **to four literals**
- b) $ABC + A'B'C + A'BC + A'B'C'$ **to five literals**
05. Design a two-level NAND-NAND circuit for the following function:

$$F(w,x,y,z) = (wxy) + (yz) \quad \mathbf{02}$$

University of Dhaka

Department of Computer Science and Engineering

First Year 2nd Semester BS (Hons.) First Incourse Examination 2013

Course No. : MATH-1123 Course Title: Linear Algebra

Full Marks: 25

Time: 1 (one) Hour

Answer any 5 questions. All questions are of equal value.

1. When is a matrix invertible? If A and B are invertible matrices of the same size, then prove that AB is invertible and $(AB)^{-1} = B^{-1}A^{-1}$.

2. Write down the augmented matrix of the following system of equations:

$$x - 2y + z = -1$$

$$2x - 3z = 2$$

$$x + y - 2z = 0$$

Hence solve the system of linear equations.

3. Reduce the matrix $A = \begin{pmatrix} 1 & 3 & -1 & 2 \\ 0 & 11 & -5 & 3 \\ 2 & -5 & 3 & 1 \\ 4 & 1 & 1 & 5 \end{pmatrix}$ to its echelon form and hence find its rank.

4. Suppose $A = \begin{pmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{pmatrix}$. Find A^{-1} if possible. Let A, X, Y be square matrices such

that $AX = I$ and $YA = I$, show that $X = Y$.

5. Determine the values of k such that the system in unknowns x, y, z has (i) a unique solution, (ii) no solution and (iii) more than one solution. Hence solve them completely in each case when consistent:

$$kx + y + z = 1$$

$$x + ky + z = 1$$

$$x + y + kz = 1$$

6. Express the following system in matrix form and then solve it by inverse matrix technique:

$$3x_1 - x_2 + x_3 = -5$$

$$-x_1 - x_2 = 1$$

$$x_1 + x_3 = -4$$

University of Dhaka
Dept. of Computer Science & Engineering
1st Year 2nd Semester 1st Mid Term Examination – 2013
CSE-1201: Discrete Mathematics

Time: 1 hour

Full Marks: 40

1. What is Mathematical Induction? Using Mathematical Induction, Prove that $2^n < n!$ for every positive integer n with $n \geq 4$. 5
2. Write algorithm of Euclid method for generating GCD. Find GCD(1123, 620). 5
3. Find public and private key pair using RSA when $p = 37$ and $q = 23$. 5
4. Find x using Chinese Remainder Theorem where, 5
 - $x \equiv 2 \pmod{3}$
 - $x \equiv 3 \pmod{5}$
 - $x \equiv 2 \pmod{7}$
 - $x \equiv 1 \pmod{11}$
5. Verify that the proposition $[p \wedge (p \rightarrow q)] \rightarrow q$ is a tautology. 5
6. Translate each of these statements into logical expressions using predicates, quantifiers, and logical connectives. 5
 - a) No one is perfect.
 - b) Not everyone is perfect.
 - c) All your friends are perfect.
 - d) At least one of your friends is perfect.
 - e) Not everybody is your friend or someone is not perfect.
7. Test the validity of the following argument: 5
 - If I study, then I will not fail mathematics.
 - If I do not play basketball, then I will study.
 - But I failed Mathematics.
 - Therefore I must have played basketball.
8. Write Sieve Method for finding all prime numbers up to 1000000. 5

University of Dhaka
Department of Computer Science and Engineering
First Year Second Semester BS (Honours) 2013 2nd In-course Examination
Course No. MATH - 1223 Course Title: Linear Algebra
Full Marks: 25 Time: 1 (One) Hour
N.B. All questions are of equal value. Answer any 5 (five) questions.

- ✓ 1. Define linear dependence and independence of a set of vectors in a vector space. Determine whether the vectors $(2, -1, 0, 3)$, $(1, 2, 5, -1)$ and $(7, -1, 5, 8)$ in \mathbb{R}^4 are linearly dependent or independent.
2. Define basis and dimension of a vector space. Write down the standard bases for \mathbb{R}^4 , P_4 and $M_{4 \times 4}$. What are the dimensions of the above bases?
- ✓ 3. Let S and T be the following subspaces of \mathbb{R}^4 :
$$S = \{(x, y, z, t) : y + z + t = 0\}$$
$$T = \{(x, y, z, t) : x + y = 0, \quad z - 2t = 0\}$$
Find basis and dimension of $S \cap T$.
- ✓ 4. Define the kernel and image of a linear transformation. Let $T : \mathbb{R}^3 \rightarrow \mathbb{R}^3$ be the linear operator defined by
$$T(x, y, z) = (3x - y, y - z, 3x - 2y + z)$$
Find a basis and the dimension of the image of T .
- ✓ 5. Let $T : \mathbb{R}^2 \rightarrow \mathbb{R}^3$ be the linear transformation defined by
$$T(x_1, x_2) = (x_2, -5x_1 + 13x_2, -7x_1 + 16x_2)$$
. Find the matrix for T with respect to the bases $B = \{(3, 1), (5, 2)\}$ and $B' = \{(1, 0, -1), (-1, 2, 2), (0, 1, 2)\}$.
6. Find all eigenvalues and associated eigenvectors of the matrix

$$A = \begin{pmatrix} 4 & 3 \\ 2 & 5 \end{pmatrix}.$$

Is A diagonalizable? If so, find an invertible matrix P that diagonalizes A .

Best of Luck

Department of Computer Science & Engineering
1st Year 2nd Semester B.Sc. (Hons.) Midterm Examination-2, 2013
STAT-1224: Introduction to Statistics
Total Marks: 20 **Time: 1.0 Hour**

Answer all the questions

1. Define Arithmetic Mean, Geometric Mean and Harmonic Mean. A variable X takes on n values, which are in geometric progression. Show that $AM \times HM = GM^2$ (6)
2. The thickness of a particular metal part of an optical instrument was measured on 121 successive items as they come off production line under what was believed to be normal conditions and constructed the following frequency distribution. Calculate Median for these data. (4)

Class Boundaries	Class Frequencies
3.195 – 3.245	2
3.245 – 3.295	14
3.295 – 3.345	24
3.345 – 3.395	46
3.395 – 3.445	22
3.445 – 3.495	10
3.495 – 3.545	2
3.545 – 3.595	1
Total	121

3. What is measure of dispersion? Why do we need a measure of dispersion? (3)
4. Refer to Question 2, find the quartile deviation. (4)
5. If \bar{x} and σ denote respectively the mean and standard deviation of a set of n non-negative values, then prove that $\left(\frac{\sigma}{\bar{x}}\right)^2 < (n - 1)$ (5)
6. The summary of score (runs) of two players from a cricket team is given in the following table

	Player A	Player B
Average Score	30	45
Standard deviation	5	8

Which player seems to be more consistent in respect to the score? Give reasons in support to your answer. (3)

University of Dhaka
Department of Computer Science and Engineering
1st Year 2nd Semester B.Sc. in Computer Science and Engineering
Third Mid Term Examination, 2013
CSE-1201: Discrete Mathematics

Marks: 25

Time: 45 mins

1.	Given $A = \{a,b,c,d\}$ and $B = \{2,3,5\}$. Let R be the following relation from A to B : $R = \{(a,3),(a,5),(c,3),(d,2),(d,5)\}$ v) Determine the matrix of the relation. vi) Draw the arrow diagram of R . vii) Find the inverse relation R^{-1} of R . viii) Determine the domain and range of R .	5
2.	Build a trie with following words: "hi", "hello", "hell", "human", "history", "trie", "try", "troy" and "taka".	5
3.	Define the following terms with respect to tree: vi. Parent vii. Ancestor viii. Internal vertices ix. Sibling x. Subtree	5
4.	What are the main differences between graph and tree? What is m-ary tree?	5
5.	Write recursive sudo-code/algorithm for calculate nth factorial and analysis it's time complexity.	5

Class Test-2 of 1st Year 2nd Semester
Department of Computer Science & Engineering
University of Dhaka
Subject: Digital Systems
Marks: 25 Time: 1 Hour

Answer the following questions:

[All questions have the same marks (05 x 5)]

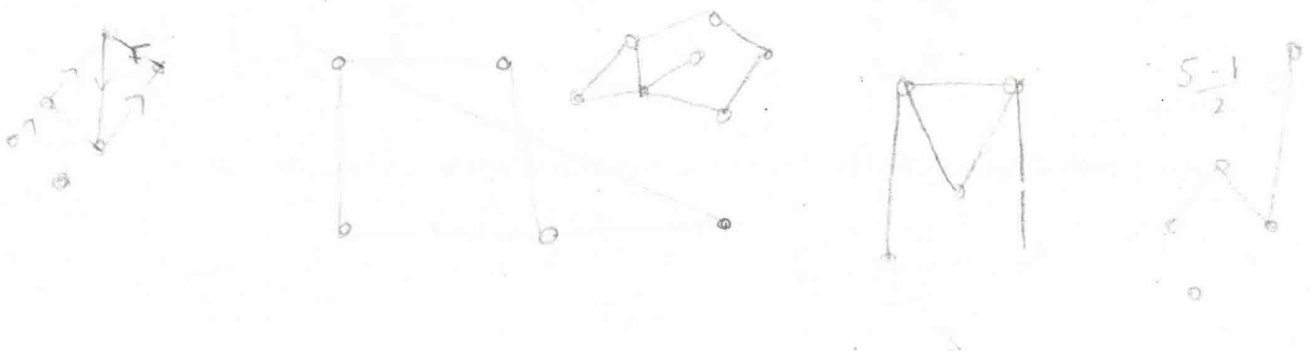
01. A J-K flip-flop is invariably used in a master-slave configuration. Why? In a master-slave J-K flip-flop, $J=K=1$. What will be the state Q_{n+1} after the clock pulse?
02. Realize D-latch using S-R latch. How is it different from D flip-flop? Draw the circuit using NAND gates and explain.
03. What is meant by triggering of a flip-flop? Distinguish between latch and edge-triggered flip-flop.
04. What are the basic characteristics of T flip-flop? Convert a J-K flip-flop into a T flip-flop.
05. Distinguish between synchronous and asynchronous counters using examples. Construct a scale-of-five up-counter and explain its operation.

Department of Computer Science and Engineering, University of Dhaka
CSE-1201: Discrete Mathematics
2nd Incourse Examination

Time: 40 min

Full Marks: 20

1. Define Hamilton path. What are the difference between Hamilton path and Euler path? 2+3
2. Is there any graph that have Euler path but not Hamilton path. Explain. 5
3. Find a simple graph with n vertices with $n \geq 3$ that does not have a Hamilton circuit, yet the degree of every vertex in the graph is at least $(n-1)/2$. 5
4. Show that the polynomial function $f: \mathbb{Z}^+ \times \mathbb{Z}^+ \rightarrow \mathbb{Z}^+$ with $f(m,n) = (m+n-2)(m+n-1)/2 + m$ is one-to-one and onto. 5



5. Prove that the algebraic sum of the deviations of the values x_1, x_2, \dots, x_n from their arithmetic mean (\bar{x}) is zero. (3)

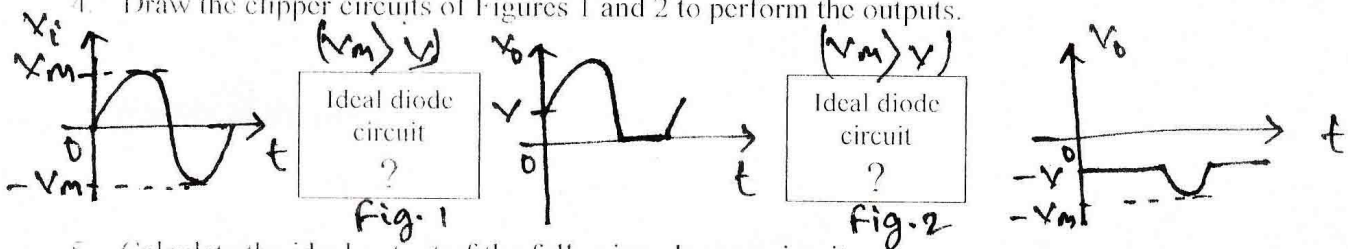
In-course Exam, 2013 (2nd Semester)
Dept. of Computer Science and Engineering, DU
EEF-1222: Basic Electronics

Time: 40 Minutes

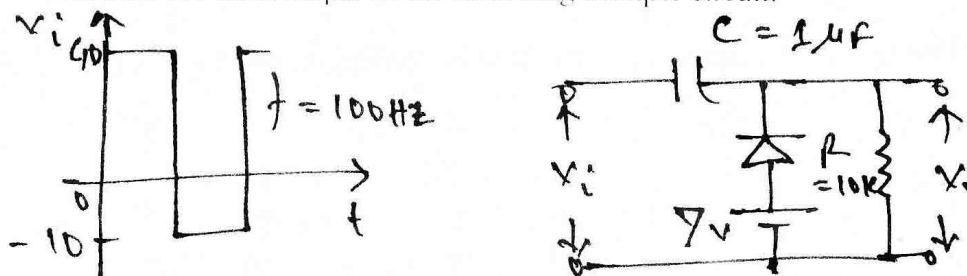
Full Marks: 20

Answer any four:

- ✓ 1. What are p-type and n-type semiconductors? Explain how depletion layer is formed in a p-n junction. 5
- ✓ 2. Discuss forward and reverse characteristics of a diode. 5
- ✓ 3. What is rectifier? Draw a full wave bridge rectifier circuit and explain its operations. 5
4. Draw the clipper circuits of Figures 1 and 2 to perform the outputs. 5



5. Calculate the ideal output of the following clamper circuit. 5



6. Differentiate between light emitting (LED) diode and Zener diode and also explain Zener breakdown. 5