Department of Computer Science & Engineering
1st Year 2nd Semester B.Sc. (Hons.) Second Midterm Examination, 2014
STAT-1224: Introduction to Statistics
Total Marks: 25 **Time: 1.0 Hour**

Answer all the questions

1. For a set of two non –zero positive values x_1, x_2, prove that $AM \geq GM \geq HM$ **(5)**

2. Hayes Textiles has shown the following percentage increase (+)/decrease (-) in net worth over the last five years: **(3)**

1992	1993	1994	1995	1996
+5	+3	-2	+2	+8

What is the average percent increase/decrease in net worth over the 5-year period?

3. A sample of the residents of Twin Lakes Retirement Village have this frequency distribution of age (in years)

Age	50-55	55-60	60-65	65-70	70-75	75-80
Frequency	5	17	31	58	20	9

Find mean deviation and quartile deviation. **(5)**

4. Find the standard deviation of first 100 natural numbers. **(4)**

5. For a set of values $x_1, x_2, \ldots, x_n$ prove that the mean deviation about the arithmetic mean cannot exceed the standard deviation. **(4)**

6. The following data is a sample of the daily production rate of fiberglass boats from a manufacturer

17 21 18 27 17 21 20 22 18 23

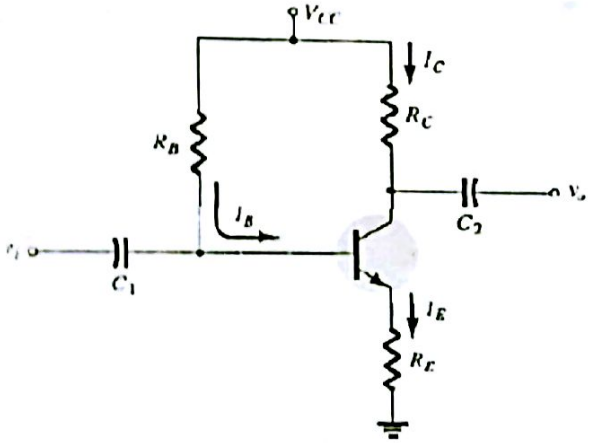
The company production manager feels that a standard deviation of more than 3 boats a day indicates unacceptable production-rate variations. Should she be concerned about plant-production rates? **(4)**

2nd In-course Exam, 2014
EEE-1222: Basic Electronics
CSE, DU

Time: 40 Minutes **Full Marks: 20**

Answer any four:

1. Draw a common base configuration circuit and explain its input and output characteristics.
2. What is transistor biasing? Explain an emitter stabilized bias circuit and draw the load line of the bias circuit.
3. For the following bias circuit with $R_B = 200$ K , $R_C = 2$ K , $R_E = 1$ K , $\beta = 100$, and $V_{CC} = 20$ volt, determine I_C, V_B, V_C, V_{CE}, V_{BC}.



4. Design a voltage divider bias circuit with $V_{CC} = 20$ volt, and $\beta=100$.
5. Draw a hybrid equivalent circuit of a single stage small signal common emitter amplifier and calculate its input impedance and voltage gain.

University of Dhaka

Department of Computer Science and Engineering

First Year Second Semester BS (Honours) 2nd In-course Examination 2014

Course No. MATH - 1223 **Course Title: Linear Algebra**

Full Marks: 30 **Time: 1 (One) Hour**

N.B. All questions are of equal value. Answer any 4 (four) questions.

1. **Define linear dependence and independence of a set of vectors in a vector space. Determine whether the vectors $v_1 = (1, -2, 1)$, $v_2 = (2, 1, -1)$ and $v_3 = (7, -4, 1)$ in $\mathbf{R}^3$ are linearly dependent or independent.**

2. **Define basis and dimension of a vector space. Let U be the subspace of $\mathbf{R}^3$ spanned by the vectors $(1, 2, 1)$, $(2, 1, -1)$ and $(7, -4, 1)$. Find a basis and dimension of U.**

3. **State dimension theorem. Find the rank and nullity of the matrix**

$$A = \begin{pmatrix} 1 & -1 & 3 \\ 5 & -4 & -4 \\ 7 & -6 & 2 \end{pmatrix}$$

and verify the dimension theorem.

4. **Define the kernel and image of a linear transformation. Let $T: \mathbf{R}^3 \to \mathbf{R}^3$ 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 kernel of T.

5. **Find all eigenvalues and associated eigenvectors of the matrix**

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

University of Dhaka
Department of Computer Science & Engineering
CSE 1201 – Discrete Mathematics
2nd In-course Examination
Time: 50 Minutes Marks: 30

1. Show that there are infinitely many primes. [5]

2. Use modular exponentiation to find $74^{324} \bmod 25$. [5]

3. Convert $ACF9_{16}$ to binary. Convert that to decimal. [5]

4. How many strings of eight English letters are there that starts with X and contains at least one vowel? [5]

5. In how many ways can a photographer at a wedding arrange 7 people in a row from a group of 11 people where the bride and groom are among these 11 people such that [5]
   i) both bride and groom **must** be in the picture?
   ii) both bride and groom must be in the picture and they should be standing **together**?

6. What is the minimum number of students, each of whom comes from one of the 64 districts of Bangladesh, who must be enrolled in CSEDU to guarantee that there are at least 80 students who come from the same district? [5]

[Bonus Question]

7. Find an increasing subsequence of maximal length and a decreasing subsequence of maximal length in the sequence 22, 5, 7, 2, 23, 10, 15, 21, 3, 17. [2]

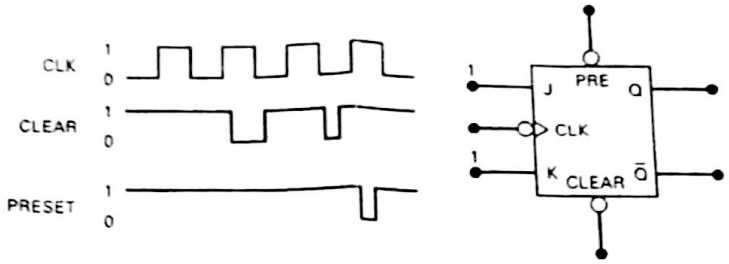
$\frac{N}{k}+1 = 80$
$\Rightarrow \frac{N}{k} = 79 \therefore N = 79 \times k \Rightarrow$

• Everyone in CSEDU
• $k=64$, $N=?$ $\lceil \frac{N}{k} \rceil = 80$

Department of Computer Science & Engineering, University of Dhaka
Incourse - 2
EEE – 1221 Digital Systems
Marks – 25 Time – 1 hour

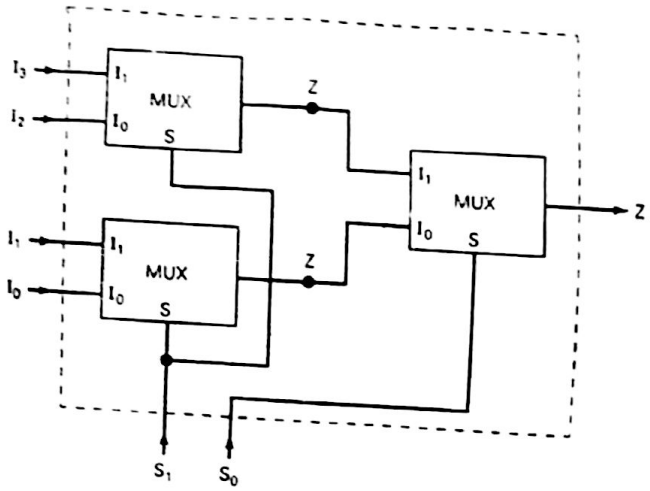
Attempt all questions:

1. Determine the Q waveform for the following FF. Assume that Q=0 initially.



2. For each item, indicate whether it is referring to a decoder, an encoder, a MUX, or a DEMUX.
   (a) Has more inputs than outputs.
   (b) Uses SELECT inputs.
   (c) Can be used to generate arbitrary logic functions.
   (d) Produces a binary code at its output.

3. The circuit of the following figure uses three two-input multiplexers. Determine the functions performed by this circuit.

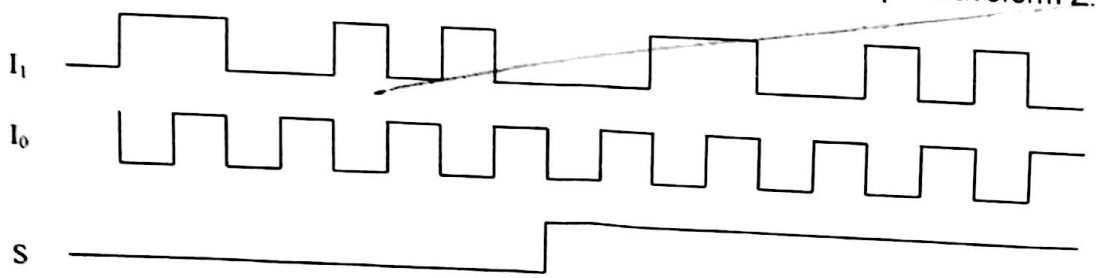


4. A four-bit ripple counter is driven by a 20-MHz clock signal. Draw the waveforms at the output of each FF if each FF has t_{pd} = 20 ns. Determine which counter states, if any, will not occur because of the propagation delays.

5. Show how an edge-triggered D FF can be made to operate in the toggle mode?

6. A binary counter is being pulsed by a 256 KHz clock signal. The output frequency from the last FF is 2 KHz.
   i) Determine the MOD number.
   ii) Determine the counting range.

7. The following timing diagram is applied to a 2-input multiplexer. Draw the output waveform Z.



8. For a 74ALS138 (1-of-8 decoder) what input conditions will produce LOW at $\overline{O_6}$?

Department of Computer Science & Engineering, University of Dhaka

Incourse - 1

EEE – 1221 Digital Systems

Marks – 30 Time – 1 hour

Attempt all questions:

1. Show the bit configuration that represents the decimal number 387 in 4
   (a) binary
   (b) BCD
   (c) ASCII
   (d) ASCII with even parity.

   Hint: The ASCII code of zero (0) is 30_{16}.
2. A limited number system uses base 12. Suppose there are at most four integer digits. The weights of the digits are 12^3, 12^2, 12^1, and 12^0. Special names are given to the weights as follows: 12 = 1 dozen, 12 = 1 gross, and 12 = 1 great gross. 3
   (a) How many beverage cans are in 6 great gross + 8 gross + 7 dozen + 4?
   (b) Find the representation in base 12 for 7569_{10} beverage cans.

   Note: available digits are: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B.
3. Using DeMorgan's theorem, express the function $F = \bar{A}BC + A\bar{C} + \bar{A}B$ with only OR and complement operations. 3
4. Optimize the Boolean expression $F = AB\bar{C}D + AC\bar{D} + A\bar{B}C + \bar{C}D$ using K-map. 2.5
5. The Boolean expressions of the two variables X and Y in terms of the three inputs A, B and C are given by 4

$$X = ABC + \bar{A}B\bar{C} + A\bar{B}\bar{C}$$

$$Y = (\bar{A} + \bar{B} + \bar{C})(\bar{A} + B + C)(A + \bar{B} + C)$$

   What is the relationship between X and Y?
6. Subtract 91B from 6F2 (do all calculations in Hexadecimal number system) 2.5
7. Construct a Full Adder circuit using only NAND gates. 4
8. Construct a full subtractor using two half subtractors. 4
9. Suppose, you need a NOT gate. But you have only AND, OR, XOR and XNOR gate. Can you implement a NOT gate using those gates? Justify your answer. 3

University of Dhaka
Department of Computer Science & Engineering
CSE 1201 – Discrete Mathematics
2nd In-course Examination
Time: 50 Minutes Marks: 30

---

1. Show that there are infinitely many primes. [5]

2. Use modular exponentiation to find $74^{324} \bmod 25$. [5]

3. Convert $ACF9_{16}$ to binary. Convert that to decimal. [5]

4. How many strings of eight English letters are there that starts with X and contains at least one vowel? [5]

5. In how many ways can a photographer at a wedding arrange 7 people in a row from a group of 11 people where the bride and groom are among these 11 people such that [5]
   i) both bride and groom **must** be in the picture?
   ii) both bride and groom must be in the picture and they should be standing **together**?

6. What is the minimum number of students, each of whom comes from one of the 64 districts of Bangladesh, who must be enrolled in CSEDU to guarantee that there are at least 80 students who come from the same district? [5]

[Bonus Question]

7. Find an increasing subsequence of maximal length and a decreasing subsequence of maximal length in the sequence 22, 5, 7, 2, 23, 10, 15, 21, 3, 17. [2]

Department of Computer Science & Engineering

1st Year 2nd Semester B.Sc. (Hons.) Final Midterm Examination, 2014

STAT-1223: Introduction to Statistics

Total Marks: [illegible] Time: 1.0 Hour

Answer all the questions

1. Classify the following variables (categorical/discrete/continuous) and mention their scale of measurement. (5)

   Frequency of visits by health workers (frequent, occasional, rare, and never), Calendar time (For example 5 AM, 7 AM etc), Marital status (single, married, widowed, divorced and separated), No. of call received in one hour interval, Fat consumed (in gm).

2. The tensile strength of 40 samples of rubber was measured and the results, in suitable units, were as follows. (6)

17.4	16.0	14.1	15.3	16.1	15.9	16.3	18.6	17.9	16.7	15.4	14.5
15.6	15.9	17.1	15.6	14.2	16.9	16.0	17.1	18.8	15.1	16.2	16.4
17.2	18.1	15.2	17.8	15.1	17.7	18.0	18.6	16.9	16.8	17.1	16.8
15.7	16.6	18.1	17.1								

   a) Showing details of your calculation, organize the data into a frequency distribution.
   b) Draw a histogram and a frequency polygon from the frequency distribution constructed in part (a)

3. Define the followings with example
   Arithmetic Mean, Median, Mode

4. Calls made by a telephone saleswoman were monitored. The lengths (in minutes) of 30 calls are summarized in the following table.

Length of call	0 – 3	3 – 5	5 – 8	8 – 11	11 – 15
Number of calls	6	17	4	2	1

   Compute arithmetic mean and median length of call. (5)

5. Prove that the Arithmetic mean is dependent on both origin and scale. (3)

University of Dhaka

Department of Computer Science and Engineering

First Year Second Semester BS (Honours) 2014 1st In-course Examination
Course No. MATH - 1223 Course Title: Linear Algebra
Full Marks: 30 Time: 1 (One) Hour

N.B. All questions are of equal value. Answer any 5 (five) questions.

1. When is a matrix invertible? If A is an invertible matrix, then prove that A^T is invertible. Also show that the matrices $A = \begin{pmatrix} 1 & -1 & 1 \\ 0 & 2 & -1 \\ 2 & 3 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{pmatrix}$ are inverses to each other.

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

$$2x - 4y - z = -8$$
$$4x - 8y + 3z = 4$$
$$-2x + 4y + z = 11$$

Hence solve the system of linear equations.

3. a) Show that $(AB)^{-1} = B^{-1}A^{-1}$ for $A = \begin{pmatrix} 4 & 3 \\ 3 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 5 \\ 3 & 7 \end{pmatrix}$.

b) If $A^{-1} = \begin{pmatrix} -3 & 4 \\ -2 & 3 \end{pmatrix}$ then find A if possible.

4. (a) Find the adjoint of the matrix $A = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$. Also find the inverse of A if exist.

(b) Show that the product of a matrix and its transpose is symmetric.

5. Determine the values of k such that the following system in unknowns x, y, z has (i) a unique solution, (ii) no solution and (iii) more than one solution:

$$x - 3z = -3$$
$$2x + ky - z = -2$$
$$x + 2y + kz = 1$$

6. Define the terms Euclidean inner product, norm and distance in $\mathbb{R}^n$ and $\mathbb{C}^n$. Find the Euclidean norms of $\underline{u}$ and $\underline{v}$; inner product $\underline{u} \cdot \underline{v}$ and distance between $\underline{u}$ and $\underline{v}$ where $\underline{u} = (2+3i, 1+i, 3+7i)$, $\underline{v} = (4-5i, 3i, 5+4i)$ in $\mathbb{C}^3$.

Best of Luck

University of Dhaka

Department of Computer Science and Engineering

First Year Second Semester BS (Honours) 2nd In-course Examination 2014

Course No. MATH - 1223 **Course Title: Linear Algebra**

Full Marks: 30 **Time: 1 (One) Hour**

N.B. All questions are of equal value. Answer any 4 (four) questions.

1. **Define linear dependence and independence of a set of vectors in a vector space. Determine whether the vectors $v_1 = (1, -2, 1)$, $v_2 = (2, 1, -1)$ and $v_3 = (7, -4, 1)$ in R^3 are linearly dependent or independent.**

2. **Define basis and dimension of a vector space. Let U be the subspace of R^3 spanned by the vectors $(1, 2, 1)$, $(2, 1, -1)$ and $(7, -4, 1)$. Find a basis and dimension of U.**

3. **State dimension theorem. Find the rank and nullity of the matrix**

$$A = \begin{pmatrix} 1 & -1 & 3 \\ 5 & -4 & -4 \\ 7 & -6 & 2 \end{pmatrix}$$

and verify the dimension theorem.

4. **Define the kernel and image of a linear transformation. Let $T : R^3 \to R^3$ 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 kernel of T.

5. **Find all eigenvalues and associated eigenvectors of the matrix**

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

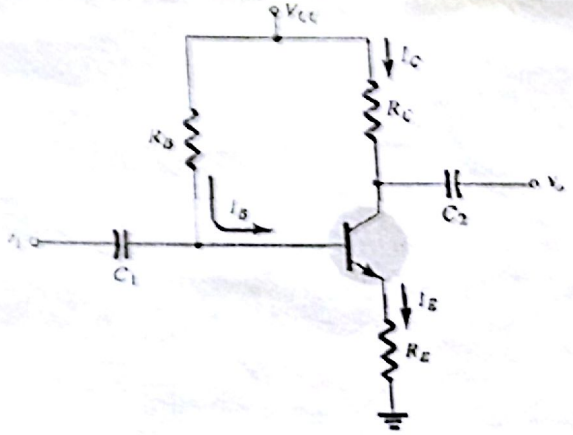
2nd In-course Exam, 2014
EEE-1222: Basic Electronics
CSE, DU

Full Marks: 20

Time: 40 Minutes

Answer any four:

1. Draw a common base configuration circuit and explain its input and output characteristics.
2. What is transistor biasing? Explain an emitter stabilized bias circuit and draw the load line of the bias circuit.
3. For the following bias circuit with $R_B = 200$ K , $R_C = 2$ K , $R_E = 1$ K , $\beta = 100$, and V_{CC} = 20 volt, determine I_C, V_B, V_C, V_{CE}, V_{BC}.



4. Design a voltage divider bias circuit with $V_{CC} = 20$ volt, and $\beta=100$.
5. Draw a hybrid equivalent circuit of a single stage small signal common emitter amplifier and calculate its input impedance and voltage gain.

Department of Computer Science & Engineering

1st Year 2nd Semester B.Sc. (Hons.) Second Midterm Examination, 2014

STAT-1224: Introduction to Statistics

Total Marks: 25 **Time: 1.0 Hour**

Answer all the questions

1. For a set of two non –zero positive values x_1, x_2, prove that $AM \geq GM \geq HM$ **(5)**

2. Hayes Textiles has shown the following percentage increase (+)/decrease (-) in net worth over the last five years: **(3)**

1992	1993	1994	1995	1996
+5	+3	-2	+2	+8

What is the average percent increase/decrease in net worth over the 5-year period?

3. A sample of the residents of Twin Lakes Retirement Village have this frequency distribution of age (in years)

Age	50-55	55-60	60-65	65-70	70-75	75-80
Frequency	5	17	31	58	20	9

Find mean deviation and quartile deviation. **(5)**

4. Find the standard deviation of first 100 natural numbers. **(4)**

5. For a set of values $x_1, x_2, \ldots, x_n$ prove that the mean deviation about the arithmetic mean cannot exceed the standard deviation. **(4)**

6. The following data is a sample of the daily production rate of fiberglass boats from a manufacturer

17 21 18 27 17 21 20 22 18 23

The company production manager feels that a standard deviation of more than 3 boats a day indicates unacceptable production-rate variations. Should she be concerned about plant-production rates? **(4)**