IN-COURSE-1 SET-B

Basic Electronics (EEE: 1222)

Dept. of Computer Science and Engineering

University of Dhaka

Full marks: 20 **Duration: 50 Mins**

11. Draw the input characteristic of common base configuration of BJT. Explain the effect of varying V_{CB}. 2.5
12. Draw the voltage divider biasing circuit. What are benefits of using this arrangement? 1.5
13. What are the functions of the coupling and bypass capacitors? 2
14. What are two models utilized for BJT small signal analysis? What is the reason of using the term 'small signal'? 1.5
15. Draw the hybrid (h) equivalent circuit for a common emitter configuration. 2
16. Explain why the output is 180^0 phase shifted (out of phase with the input) in a common emitter amplifier? 3
17. What are the differences between BJT and FET? 2
18. Explain how the JFET can be used as a variable resistor. 1.5
19. What are the constructional difference between the depletion type and enhancement type MOSFET. 2
20. Show how CMOS can be used as an inverter. 2

IN-COURSE-1

Basic Electronics (EEE: 1222)

Dept. of Computer Science and Engineering

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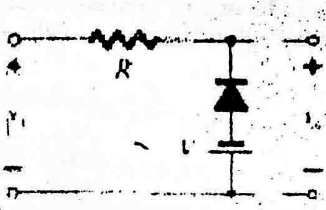
Full marks: 20 **Duration: 50 Mins**

15. What is the difference between conductor and semiconductor in terms of temperature effect? 1
16. Why it is possible to convert an intrinsic semiconductor to an extrinsic? 1
17. Explain graphically the idea of bandgap. 1
18. Draw the I-V curve of a diode with proper units. 2
19. Why there exists a 0.3 V across the junction of Ge? 1
20. What is the operational principle of a tunnel diode? 2
21. Draw and explain the operation of a full wave rectifier circuit. 2
22. Explain this clipper circuit for a sinusoidal input signal v_i. 3



23. Draw the symbol of pnp and npn transistors. 1
24. What is the biasing arrangement if you want to operate the BJT in saturation region? 1
25. How ' α alpha' is defined? 1
26. Why we call I_{CBO} REVERSE SATURATION current? 1
27. What is the necessity of DC biasing? 2
28. What is stability factor? 1

Total Marks: 30 Time: 1 Hour

Answer all Questions (4x5).

01. What is decision diagram (DD)? Explain the reduction rules of DD using examples. Calculate the total number of nodes in a DD.

02. Define Programmable Logic Arrays (PLAs) with their advantages & disadvantages. Show a design for a PLA for a multi-output function with at least 5 functions.

03. What is sequential circuit? Distinguish between combinational & sequential circuits. How a logic gate can be converted into a memory device?

04. What is R-S flip-flop? Explain the working principle of a R-S flip-flop? Present a method with an example to overcome the limitation of a R-S flip-flop.

05. Explain the working principle of a D flip-flop by using one of its applications. Distinguish the properties of a frequency counter & a shift-register counter.

Subject: CSE
Course No: MATH 1223
Course Title: Linear Algebra

Total Marks : 30 Time: 45 Minutes

Answer any THREE of the following questions:-

Marks

Q1.	**(a) Define determinant, Minors and Cofactors.**	5
	(b) Show that $\begin{vmatrix} a+b+c & -c & -b \\ -c & a+b+c & -a \\ -b & -a & a+b+c \end{vmatrix} = 2(a+b)(b+c)(c+a)$	5

Q2.	**When is a system of equations consistent? Determine the values λ such that the following system of linear equations has (i) a unique solution, (ii) no solution and (iii) more than one solution.** $x+y-z=1$ $2x+3y+\lambda z=3$ $x+\lambda y+3z=2$	10

Q3.	**When is a matrix said to be in row echelon form? When in reduced row echelon form? Reduce the following matrix to row echelon form and then to reduced row echelon form:** $A=\begin{pmatrix} 1 & -2 & 3 & -1 \\ 2 & -1 & 2 & 2 \\ 3 & 1 & 2 & 3 \end{pmatrix}$	10

Q4.	**(a) Define vector space.** Show that V = (x, y, 0) is a vector space.	5
	(b) Define linear combination of a set of vector space. Show that $A=\begin{pmatrix} 3 & -1 \\ 1 & -2 \end{pmatrix}$ is linear combination of $A1=\begin{pmatrix} 1 & 1 \\ 0 & -1 \end{pmatrix}$, $A2=\begin{pmatrix} 1 & 1 \\ -1 & 0 \end{pmatrix}$ and $A3=\begin{pmatrix} 1 & -1 \\ 0 & 0 \end{pmatrix}$	5

University of Dhaka

1^{st} year 2^{nd} Semester Incourse Exam 2011

Subject : Computer Science and Engineering

Course Title: Linear Algebra & Matrices

Course No.: MATH 1223

Full Marks: 25 Time: 1 hour

Answer any 2 (TWO) questions

	(a) Evaluate the eigenvalues and eigenvectors of the following matrix $$A=\begin{pmatrix}1 & 2 & -1\\ 1 & 0 & 1\\ 4 & -4 & 5\end{pmatrix}.$$	7
	(b) Find a matrix P that diagonalizes the matrix $A=\begin{pmatrix}-14 & 12\\ -20 & 17\end{pmatrix}$ and also find $P^{-1}AP$.	6
Q2.	(a) Define Basis and dimension of vector spaces.	4
	(b) Show that $S=\{(1,2,0),(0,5,7),(-1,1,3)\}$ forms a basis for $\Re^3$. Also find the dimension of S.	8
Q3.	(a) Define linear transformation. Determine which of the following transformation is linear: (i) $T:\Re^2\to\Re^2$ defined by $T(x,y)=(x+1,y+2)$ (ii) $T:\Re^2\to\Re^3$ defined by $T(x_1,x_2)=(x_1,x_1+x_2,x_1-x_2)$.	6
	(b) Define the kernel and image of a linear transformation. Let $T:\Re^4\to\Re^3$ be a linear transformation defined by $T(x,y,s,t)=(x-y+s+t,x+2s-t,x+y+3s-3t)$. Find a basis and dimension of the (i) kernel of T and (ii) image of T.	7

IN-COURSE-3 SET-A

Basic Electronics (EEE: 1222)

Dept. of Computer Science and Engineering

University of Dhaka

Full marks: 20 **Duration: 50 Mins**

1. Draw the block diagram of a power supply and show the voltage waveform at each stage? 3
2. Explain the function of the Filter section within a power supply. 3
3. What do you understand by voltage regulation? Why no load voltage is higher than the full load voltage. 3
4. Explain a series regulator circuit constructed with a BJT. 3
5. Explain the operation of a SCR with characteristic curve. 4
6. What is the difference between a TRIAC and DIAC? 1
7. Explain how a relaxation oscillator (positive going spike) can be constructed by using UJT? 3

Set D CT - 3

1. Does there exist a graph with 5 vertices of degrees 1,1,3,3,4 ? Draw the graph.
2. How many vertices and edges are there in W_7 ? 1.5
3. Distinguish between complete graph and connected graph. 2
4. Draw C_{10} in bipartite form. 1
5. Define isomorphism of graphs. 2
6. Find chromatic number of the given graph. 5
   Store the graph using linked list.
7. Define planar graph. 1
8. Traverse the tree in inorder way. 1

Set A (1st year 2011, CT-2, Discrete mathematics, Time: 45 minutes, Marks:15)

1. Find out the cardinality of the set A = {13, 25, 37,........} 2
2. Distinguish between function and relation. 2
3. Find out transitive closure of relation R = {(1,2),(2,1),(3,2),(3,3)} defined on set B = {1,2,3} 2
4. Let $\approx$ be a relation on N×N defined by $(a,b) \approx (c,d)$ whenever $ad = bc$.

   Is $\approx$ an equivalence relation? 3
5. Write a relation on N which is neither symmetric nor antisymmetric. 1
6. Distinguish between one-one and onto functions 2.5
7. Is the function invertible? Explain. f = {(1,2), (2,3),(3,1),(4,3)} defined on set D ={1,2,3,4} 1
8. Is the function one-one or onto? Explain. 1.5

Set B (1st year 2011, CT-1, Discrete mathematics, Time: 30 minutes, Marks:10)

1. How many ways 3 boys and 2 girls can sit in a row that the girls always sit together? 1
2. How many students we must have to guarantee that at least two have the last names begin with the same letter? 1
3. How many bit strings of length 10 contain an equal number of 1 and 0? 1
4. State sum rule principle of counting. 1
5. Are the propositions logically equivalent? $(p \wedge r) \rightarrow (q \vee r)$ and $(p \vee q) \leftrightarrow r$ 1.5
6. Express the following statement using quantifier: No one is perfect. 1
7. Is the given implication true? Show the logic: If pigs can fly then 1+1 = 2 1
8. With example define universal generalization. 1.5
9. State the contrapositive of the implication: The home team wins whenever it is raining 1

Set B (1st year 2012, CT-2, Discrete mathematics, Time: 45 minutes, Marks:15)

How many ways 4 math, 2 chemistry and 3 physics books can be arranged on a shelf? 1

2. How many different bit strings of length seven start with 10 or ends with 1? 2.5

A bag contains 12 white, 12 blue and 12 red marbles. How many marbles must be selected to guarantee that at least 3 marbles of the same color are chosen? How many must be selected to guarantee that at least 3 red marbles are selected. 2

3. Prove the following proposition using mathematical induction: 2.5

$2^n > n^2$, n is a positive integer greater than 4

4. Solve each linear congruence equation: 4

[illegible] $\equiv 6 \pmod 9$ *ii)* $2x \equiv 3 \pmod 7$ *iii)* $5x \equiv 7 \pmod{10}$

5. Find the smallest positive integer x such that when x is divided by 2 it yields a remainder 1, when x is divided by 3 it yields a remainder 2, and when x is divided by 7 it yields a remainder 3? 3

Set C (1st year 2012, CT-2, Discrete mathematics, Time: 45 minutes, Marks:15)

1. Find the smallest positive integer x such that when x is divided by 3 it yields a remainder 1, when x is divided by 5 it yields a remainder 4, and when x is divided by 7 it yields a remainder 5?
2. Suppose a laundry bag contains 11 red, 11 white and 11 blue socks. Find the minimum number of socks that one need to choose in order to get at least 3 pieces of the same color? How many must be selected to guarantee that at least 3 red socks are selected.
3. Solve each linear congruence equation:

   i) $4x \equiv 7 \pmod 8$ *ii)* $3x \equiv 9 \pmod 9$ *iii)* $5x \equiv 2 \pmod 6$
4. How many ways 3 oranges, 2 apples and 4 mangoes can be arranged in a row?
5. Prove the following proposition using mathematical induction:

   $n! < n^n$, n is a positive integer greater than 1
6. How many different bit strings of length six start with 1 or ends with 10?

Set C (1st year 2012, CT-1, Discrete mathematics, Time: 40 minutes, Marks:10)

1. Express the following statement using quantifier and logical connectors. 1.5
   Subtractions of two negative integers are not always negative
2. Are the propositions logically equivalent? $(p \wedge r) \rightarrow (q \vee r)$ and $(p \vee q) \leftrightarrow r$ 1.5
3. With example define Existential instantiation. 1.5
4. For the following argument explain which rules of inference are used for each step. 2.5
   Everyone in Chittagong lives within 50 miles of the sea. Someone in Chittagong has never seen the sea. Therefore, someone who lives within 50 miles of the sea has never seen the sea.
5. State the contrapositive of the implication:
   If it does not rain today, I will go to school tomorrow. 1
6. Express the following statement using quantifier: 2
   i) Lions don't drink coffee.
   ii) No large birds live on honey

Set C (1st year 2012, CT-2, Discrete mathematics, Time: 45 minutes, Marks:15)

1. Find the smallest positive integer x such that when x is divided by 3 it yields a remainder 1, when x is divided by 5 it yields a remainder 4, and when x is divided by 7 it yields a remainder 5?
2. Suppose a laundry bag contains 11 red, 11 white and 11 blue socks. Find the minimum number of socks that one need to choose in order to get at least 3 pieces of the same color? How many must be selected to guarantee that at least 3 red socks are selected.
3. Solve each linear congruence equation:
   i) $4x \equiv 7 \pmod 8$ *ii)* $3x \equiv 9 \pmod 9$ *iii)* $5x \equiv 2 \pmod 6$
4. How many ways 3 oranges, 2 apples and 4 mangoes can be arranged in a row?
5. Prove the following proposition using mathematical induction:
   $n! < n^n$, n is a positive integer greater than 1
6. How many different bit strings of length six start with 1 or ends with 10?

Set A (1st year 2012, CT-3, Discrete mathematics, Time: 45 minutes, Marks: 15)

1. Prove the following proposition using mathematical induction:

   $3^n < n!$, n is a positive integer greater than 6
2. Solve each linear congruence equation:

   i) $5x \equiv 2 \pmod 7$ *ii)* $4x \equiv 7 \pmod{10}$ *iii)* $3x \equiv 9 \pmod 6$
3. Find the smallest positive integer x such that when x is divided by 2 it yields a remainder 1, when x is divided by 3 it yields a remainder 2, and when x is divided by 5 it yields a remaind
4. How many ways 2 men, 4 boys and 3 girls can sit in a row?
5. How many different bit strings of length six start with 1.1 or ends with 0?
6. How many cards must be selected from a standard deck of 52 cards to guarantee that at least 3 cards of the same suit are chosen? How many must be selected to guarantee that at least 3 hearts are selected.

Set C (1st year 2012, CT-2, Discrete mathematics, Time: 45 minutes, Marks: 15)

1. Find the smallest positive integer x such that when x is divided by 3 it yields a remainder 1, when x is divided by 5 it yields a remainder 4, and when x is divided by 7 it yields a remainder 5?
2. Suppose a laundry bag contains 11 red, 11 white and 11 blue socks. Find the minimum number of socks that one need to choose in order to get at least 3 pieces of the same color? How many must be selected to guarantee that at least 3 red socks are selected.
3. Solve each linear congruence equation:

   i) $4x \equiv 7 \pmod 8$ *ii)* $3x \equiv 9 \pmod 9$ *iii)* $5x \equiv 2 \pmod 6$
4. How many ways 3 oranges, 2 apples and 4 mangoes can be arranged in a row?
5. Prove the following proposition using mathematical induction:

   $n! < n^n$, n is a positive integer greater than 1
6. How many different bit strings of length six start with 1 or ends with 10?

Department of Computer Science & Engineering

First Year BS (Hons) Second Semester 2011-2012

First Incourse Examination

Course # : STAT-1224 (Introduction to Statistics)

Total Marks: 30 Time: 50 Minutes

Date of Exam: 12.09.12

Answer all the Questions:

1. Define the terms with example: Population, Statistic, Quantitative variable, Primary data & Questionnaire.

2. The following table shows the frequency distribution of marks obtained by some students of CSE department.

Marks	47.5-52.5	52.5-57.5	57.5-62.5	62.5-67.5	67.5-72.5	72.5-77.5	77.5-82.5
# of students	4	9	18	24	31	16	5

Draw a histogram. Calculate AM, GM, Median and Mode.

3. Prove that
   (i) AM depends on the changes of both origin & scale of measurement.
   (ii) For two non zero & non negative values $AM \geq GM \geq HM$.

(marks: 5 + 15 + 10 = 30)

Class Test-2
Department of Computer Science & Engineering
University of Dhaka
Subject. EEE-1221: Digital Systems
Total Marks: 24
Time: 60 Minutes

01. Describe the characteristics of a K-map using examples. Point out the general rules for simplifying the Boolean functions by K-map. **05**

02 Mention the differences between K-map and binary decision diagrams. **03**

03 Explain the necessities of Minterms and Maxterms of a Boolean functions using examples. **03**

04. Compare the multiplexer and de-multiplexer with respect to their applications. ~~05~~ 6

05. What is multiple-output function? Explain the advantages and disadvantages of multiple-output functions over the single-output functions. ~~04~~ 6

06. Design a compact full-adder circuit with a decoder. ~~06~~ 12

Class Test-1
Total Marks: 24
Time: 60 Minutes
Subject: EEE-1221: Digital Systems
Department of Computer Science & Engineering
University of Dhaka

[Answer all the questions]

01. a) What is number systems? Mention the importance of decimal number system. **03**

b) Describe the Double-and-Add method for conversion of binary to decimal. **03**

c) What is nibble? Mention the differences between BCD and EBDIC codes. **02**

02. a) What is Maxterm? Explain the differences between Maxterms and Minterms. **02**

b) Define a K-map. Discuss the characteristics of a K-map. **04**

c) What are the basic criteria to determine the minimal solution of a logic function? Explain using examples. **03**

03. a) What is NAND gate? Describe the main functions of a NAND gate. **05**

b) Use Boolean algebra and prove that **02**

$$x(x \vee y) = x$$

In-course Examination (Y1S2, 2012)

CSE, DU; EEE-1222: Basic Electronics

Answer the following questions [FULL MARKS 20]:

1. Explain each term in the following JFET-equation: 4

$$I_{DS} = I_{DSS}\left(1 - \frac{V_{GS}}{V_P}\right)$$

2. What do you mean by closed-loop gain and open-loop gain in a negative feedback amplifier? 4

3. Distinguish between BJIT and FET. 4

4. Explain the following terms used in the study of SCR: 4

   (i) Breakover voltage (ii) Peak reverse voltage and (iii) Holding current.

5. What is the purpose of Phase control? Describe the phase control mechanism using SCR. 4.

Computer Science & Engineering (CSE), DU

In-course Examination (Y1S2, 2012)

EEE-1222: Basic Electronics

Time: 1 Hour and 15 Minutes

Answer the following questions [FULL MARKS 100%]:

1. What do you mean by drift current and diffusion current? — 20%

2. Draw the circuit diagram of a three-input diode AND gate. Briefly describe its operation. — 20%

3. Draw the basic circuit connection for obtaining common-base characteristics of a transistor. Explain the input characteristic with a suitable I/V curve. — 30%

4. A diode which has the characteristics shown in Fig. 1 is to pass a forward current of 20 mA when the supply is 12 V. Determine the value of resistance that must be connected in series with the diode. — 15%

5. The collector and base currents of a certain transistor are measured as — 15%

   $I_C = 5.202$ mA, $I_B = 50\ \mu A$, and $I_{CBO} = 2\ \mu A$

   Calculate α_{dc}, β_{dc}, and I_E [where the symbols have their usual meanings].

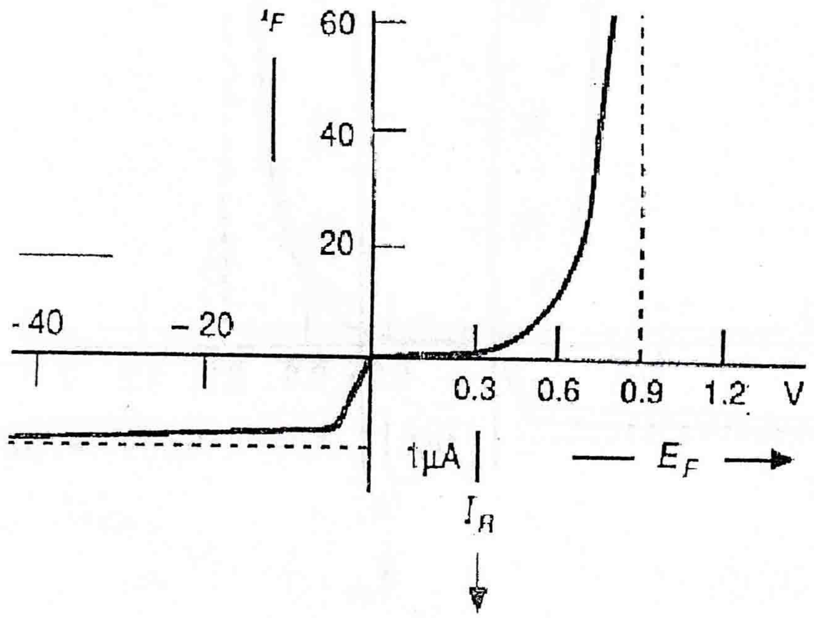


Fig. 1

University of Dhaka
Department of Computer Science & Engineering
Incourse Examination– 2
Course No. MATH-1223, Course Title: Linear Algebra
Marks: 25 Time: One (1) hour

Answer any Five (5) questions of the following. All questions are of equal value.

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

2. Define linear span and show that the vectors $(1, 1, 1)$, $(0, 1, 1)$ and $(0, 1, -1)$ generate R^3.

3. Let S and T be the following subspaces of R^4:

$$S = \{(x, y, z, t) : y + z + t = 0\}$$
$$T = \{(x, y, z, t) : x + y = 0, \quad z - 2t = 0\}$$

Find a basis and dimension of (i) S (ii) T and (iii) $S \cap T$.

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 (i) image of T and (ii) kernel of T

5. Define linear dependence and independence of vectors. Determine whether the vectors $(1, -2, 1)$, $(0, -1, 0)$ and $(2, 0, 2)$ in R^3 are linearly dependent or independent.

6. Let $T : R^2 \to R^3$ 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 $B' = \{(1, 0, -1), (-1, 2, 2), (0, 1, 2)\}$.

University of Dhaka
Department of Computer Science and Engineering
First Year Second Semester BS (Honours) 2012 1st 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. When is a matrix invertible? If A is an invertible matrix, then prove that A^T is also invertible and $(A^T)^{-1} = (A^{-1})^T$.

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. Define an involutory matrix. If A is involutory, show that $\frac{1}{2}(I + A)$ and $\frac{1}{2}(I - A)$ are idempotent and $\frac{1}{2}(I + A).\frac{1}{2}(I - A) = 0$.

4. Let $A = \begin{pmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{pmatrix}$. Find A^{-1}. 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. Define linear combination. Determine whether or not the vector $(1, 2, 6)$ is a linear combination of the vectors $(2, 1, 0)$, $(1, -1, 2)$ and $(0, 3, -4)$.

Best of Luck