

Part A [5 points]

1) Each of the following logic statements is an example of one of properties on the right. Choose the letter of the correct property.

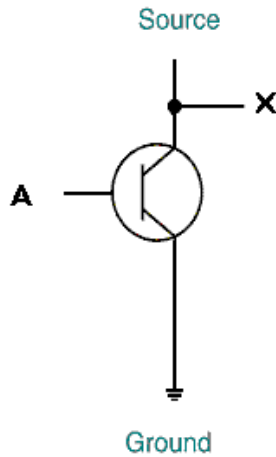
$A \bullet (B + C) = (A \bullet B) + (A \bullet C)$ ___e

$OR(A, B) = OR(B, A)$ ___b

$OR(A, 0) = A$ ___f

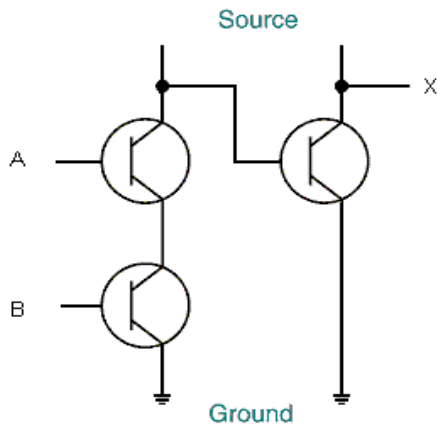
- a. Associative
- b. Commutative
- c. Compliment
- d. DeMorgan's Law
- e. Distributive
- f. Identity

2) The following transistor diagram implements which gate?



- a) AND
- b) NAND
- c) NOR
- d) NOT
- e) OR
- f) XOR

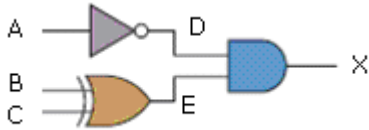
3) The following transistor diagram implements which gate?



- a) AND
- b) NAND
- c) NOR
- d) NOT
- e) OR
- f) XOR

Part B – Short Answers [10 points]

Refer to the following circuit diagram for all questions in this Part.



1. Complete the Truth Table for this circuit, including Boolean expressions for D, E, and X. [5]

A	B	C	$D = A'$	$E = B \oplus C$	$X = D \bullet E$ or DE
0	0	0	1	0	0
0	0	1	1	1	1
0	1	0	1	1	1
0	1	1	1	0	0
1	0	0	0	0	0
1	0	1	0	1	0
1	1	0	0	1	0
1	1	1	0	0	0

1 point for columns A,B,C
 1 point for correct expressions in the titles
 1 point for each correct column

2. Write a Boolean expression that represents this circuit.[2]

$X = A' \bullet (B \oplus C)$
 The parentheses are paramount.

3. Show how this circuit can be described in an Excel formula.[3]

= AND(NOT(A), B <> C)
 also = AND(NOT(A), AND(OR(B, C), NAND(B, C)))

Part C [15 points]

Use only the data shown to answer the following questions.

All ranges have been **named** using the labels that appear in the worksheets.

The graphic below is from a workbook to analyze probability in card games.

This section “deals” cards.

S_	Suit	R_	Rank	Card
1	Clubs	11	Jack	Jack of Clubs
4	Spades	14	Ace	Ace of Spades
1	Clubs	2	2	2 of Clubs
1	Clubs	8	8	8 of Clubs
1	Clubs	12	Queen	Queen of Clubs
1	Clubs	12	Queen	Queen of Clubs
3	Hearts	13	King	King of Hearts
4	Spades	5	5	5 of Spades
3	Hearts	10	10	10 of Hearts
3	Hearts	14	Ace	Ace of Hearts
3	Hearts	7	7	7 of Hearts
2	Diamonds	4	4	4 of Diamonds
1	Clubs	4	4	4 of Clubs

S_ is one of the integers 1, 2, 3, or 4, and is randomly chosen.

Suit is assigned by an IF statement according to the corresponding value of **S_**.

- 1 - Clubs
- 2 - Diamonds
- 3 - Hearts
- 4 - Spades

R_ is an integer in the range **2 to 14** inclusive, also randomly chosen.

Rank is assigned by an IF statement according to **R_**, using the following mapping:

- Values in the range 2 to 10 are copied from **R_**
- 11, 12, 13, and 14 are replaced by “Jack”, “Queen”, “King”, and “Ace”

The formula in **Card** assembles **Rank** and **Suit** into the name as shown.

You are required to write **ONLY SOME** of the formulae.

Assume that other cells contain formulae that do what's required there.

1) Show the formula for **R_**. [4]

=INT(RAND() *13) + 2

2) Show the formula for **Rank**. [4]

=IF(R_<11, R_, IF(R_=11, "Jack", IF(R_=12, "Queen", IF(R_=13, "King", "Ace"))))

A variety of answers will accomplish the task. The keys are:

- a nested IF structure with 4 IF functions 1 point
- conditions that identify each of the 5 ranges of R 1 point
- copying R into Rank for values 2 through 10 1 point
- assigning the appropriate literal strings for each other value 1 point

3) Create a formula for the **Card** column. [3]

= Rank & " of " & suit ... OR... CONCATENATE(Rank, " of ", Suit)

4) Why is this not a good way to “deal cards”? [1]

Limit your answer to **ONE SENTENCE**.

It produces duplicates.

Part C [15 points]

Use only the data shown to answer the following questions.

All ranges have been **named** using the labels that appear in the worksheets.

Here is an alternative technique for “dealing cards”.	Pos	S_	Suit	R_	Rank	Card
Pos is a random integer in the range 1 to 52, inclusive.	25	2	Diamonds	14	Ace	Ace of Diamonds
S_ is produced from the quotient of an Integer division of Pos by 13 .	27	3	Hearts	3	3	3 of Hearts
R_ is produced from the remainder of an Integer division of Pos by 13 .	32	3	Hearts	8	8	8 of Hearts
Suit and Rank use the same formulae as previously.	10	1	Clubs	12	Queen	Queen of Clubs
	22	2	Diamonds	11	Jack	Jack of Diamonds
	48	4	Spades	11	Jack	Jack of Spades
	32	3	Hearts	8	8	8 of Hearts
	5	1	Clubs	7	7	7 of Clubs
	52	5	Spades	2	2	2 of Spades
	19	2	Diamonds	8	8	8 of Diamonds
	30	3	Hearts	6	6	6 of Hearts
	40	4	Spades	3	3	3 of Spades
	34	3	Hearts	10	10	10 of Hearts
	26	3	Hearts	2	2	2 of Hearts
	16	2	Diamonds	5	5	5 of Diamonds
	30	3	Hearts	6	6	6 of Hearts
	16	2	Diamonds	5	5	5 of Diamonds
	1	1	Clubs	3	3	3 of Clubs

5) Create the formula that produces the values of **R_**.

[=MOD\(Pos,13\) +1](#)

Part D [5 points]

The following schemas describe relations in the sample database in CS:I.

- A) Movie (MovieId:key, Title, Genre, Rating)
- B) Customer (CustomerId:key, Name, Address, CreditCardNumber)
- C) Rents (CustomerId, MovieId, DateRented, DateDue)
- D) NEW \leftarrow SELECT from MOVIE where RATING = "PG"
- E) PGmovies \leftarrow PROJECT MovieId, Title from NEW
- F) TEMP1 \leftarrow JOIN CUSTOMER and RENTS
where CUSTOMER.CustomerId = RENTS.CustomerId
- G) RENTALS \leftarrow PROJECT Name, Address, MovieId from TEMP1
- H) PGrenters \leftarrow JOIN RENTALS and PGmovies
where RENTALS.MovieId = PGmovies.MovieId

For each relation below, select its schema from the list above.

1) _____ H

Name	Address	MovieId	MovieId	Title
Dennis Cook	789 Main	102	102	Back to the Future
Dennis Cook	789 Main	104	104	Field of Dreams
Randy Wolf	12 Elm	104	104	Field of Dreams
Randy Wolf	12 Elm	102	102	Back to the Future

2) _____ F

CustomerId	Name	Address	CreditCard Number	CustomerId	MovieId	DateRented	DateDue
101	Dennis Cook	789 Main	594224783671	101	102	08/11/2010	15/11/2010
101	Dennis Cook	789 Main	444704723566	101	104	04/11/2010	14/11/2010
102	Doug Nickle	456 Second	029535839093	102	101	09/11/2010	11/11/2010
103	Randy Wolf	12 Elm	486023944928	103	104	07/11/2010	10/11/2010
103	Randy Wolf	12 Elm	292827664258	103	102	05/11/2010	11/11/2010
104	Amy Stevens	Yellow Brick Road	015415754965	104	107	05/11/2010	10/11/2010
105	Susan Klaton	654 Lois Lane	883051112327	105	1033	04/11/2010	13/11/2010
107	Chris Stein	1010 Abbey Road	832941568336	107	7442	06/11/2010	13/11/2010

Part D [5 points]

3) _____ E

MovieId	Title
102	Back to the Future
104	Field of Dreams

4) _____ G

Name	Address	MovieId
Dennis Cook	789 Main	102
Dennis Cook	789 Main	104
Doug Nickle	456 Second	101
Randy Wolf	12 Elm	104
Randy Wolf	12 Elm	102
Amy Stevens	Yellow Brick Road	107
Susan Klaton	654 Lois Lane	1033
Chris Stein	1010 Abbey Road	7442

5) _____ C

CustomerId	MovieId	DateRented	DateDue
101	102	08/11/2010	15/11/2010
103	104	07/11/2010	10/11/2010
105	1033	04/11/2010	13/11/2010
102	101	09/11/2010	11/11/2010
101	104	04/11/2010	14/11/2010
104	107	05/11/2010	10/11/2010
103	102	05/11/2010	11/11/2010
107	7442	06/11/2010	13/11/2010

Part E [9 points]

- A) attribute
- B) cardinality constraint
- C) database engine
- D) database model
- E) Entity-relationship modelling
- F) Join
- G) physical database
- H) Project
- I) relation
- J) schema
- K) Select
- L) Structured Query Language
- M) subschema
- N) tuple

Select one of the terms above to complete each of the following statements.
Place the appropriate **LETTER** in the blank.

1. Relational databases are examples of a(n) _____. **D**
2. A table is also called a(n) _____. **I**
3. A field is also called a(n) _____. **A**
4. A record is also called a(n) _____. **N**
5. _____ is a database operation to create a relationship. **F**
6. _____ is a comprehensive database language for managing relational databases. **L**
7. _____ is software that supports access to and modification of the database contents. **C**
8. A(n) _____ restricts the number of members in a relationship in Access. **B**
9. _____ is a description of the entire database structure used by the database software to maintain the database. **J**

Part F [6 points]

1. What do we call the concept that data and instructions are both logically the same?
 - a) multiprogramming
 - b) real-time system
 - c) **stored program concept**
 - d) timesharing
 - e) von Neuman architecture
2. What is the name of the register that contains the address of the next instruction to be executed?
 - a) Address register
 - b) Fetch register
 - c) General purpose register
 - d) Instruction register
 - e) **Program counter**
3. The number of bits that can be transferred in parallel is called:
 - a) addressability
 - b) **bus width**
 - c) block
 - d) track
 - e) sector
4. Place these labels at appropriate places on the graphic. [½ each]
 - a) Fetch Cycle
 - b) Execution Cycle
 - c) Fetch Instruction
 - d) Decode Instruction
 - e) Get data
 - f) Execute Instruction

