CSC/2011/007 AJAYI TOMILOLA

OSUN STATE UNIVERSITY
COLLEGE OF SCIENCE, ENGINEERING AND TECHNOLOGY
FACULTY OF BASIC AND APPLIED SCIENCES
DEPARTMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY
2018/2019 HARMATTAN SEMESTER EXAMINATION

CSC 207 – DISCRETE STRUCTURE
INSTRUCTION: Answer Question 1 and Attempt any other 3 Questions
Time: 2hours

1a. In the following argument, determine whether or not the conclusion necessarily follows from the given premises.

All lecturer are rich

Rich people are never dull

Therefore, no lecturer is dull.

b. Explain the following terms

(i) Logic (ii) Tautology (iii) Partitions

c. Given A = {1, 2, 3, 4} and B = {X, Y, Z}. Consider the following relations from A to B.
R = {(1, Y), (1, Z), (3,Y), (4, X), (4, Z)}
(i) Determine the matrix of the relations.
(ii) Find the inverse relation R^{-1} of R.
(iii) Determine the domain and the range of R.

d.(i) Show that $[(P \rightarrow Q) \wedge (Q \rightarrow R)] \rightarrow (P \rightarrow R)$ is a tautology.
(ii) Simplify $A + B(A + B) + A(\bar{A} + B)$

2a. Implement this logic expression using logic diagram: $P = A.B(A + \bar{B})$

b. Rewrite the following schemas using existential quantifiers only and universal quantifiers only.

(i) $\forall x (P(x) \rightarrow \exists y (Q(y) \wedge R(x, y))$

(ii) $\neg \forall x \exists y (F(x, y) \vee G(x, y))$

3a. Draw the graph corresponding to the following sets: $X = \{1, 2, 3, 4\}$ and $R = \{(1, 2), (1, 3), (2, 3), (2, 4), (3, 4)\}$. Is the graph connected?

b. (i) Write the dual of the set equation $(A \cup B) \cap (A \cup B^c) = A \cup \emptyset$
(ii) Given any Set A, B and C, Prove that $(A \cup B) \times C = (A \times C) \cup (B \times C)$

4a. Write predicate calculus schemas to represent the following statements.

(i) Some of the lecturers know the answer.
None of the students knows the answer.
None of the lecturers is a student.

(i) Either nobody goes or everyone goes
If John goes, Mary will not go.
John will not go.

b. Show by using truth table that the conditional $p \rightarrow q$ and its inverse $(\sim p) \rightarrow (\sim q)$ are not logically Equivalent. (Hint: $p \rightarrow q \neq (\sim p) \rightarrow (\sim q)$)

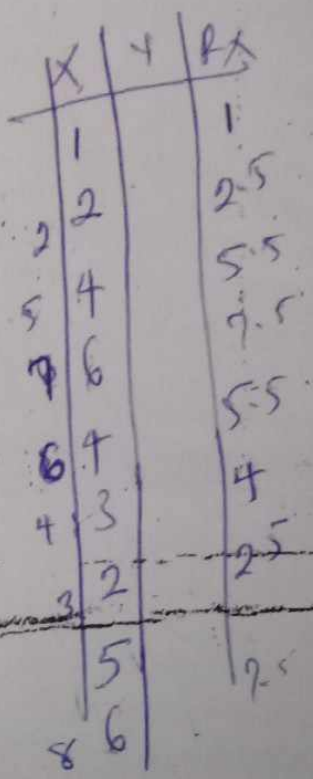
5a. Given A = {1, 2, 3, 4} and B = {X, Y, Z}. Consider the following relations from A to B.
R = {(1, Y), (1, Z), (3,Y), (4, X), (4, Z)}
(i) Determine the matrix of the relations.
(ii) Find the inverse relation R^{-1} of R.
(iii) Determine the domain and the range of R.

b. Define the following terms:
(i) Finite set (ii) Empty set (iii) Infinite set (iv) Tautology (v) Contradiction

6a. Translate these arguments into symbols, construct appropriate truthtable and test the invalidity.

If I study, then I will not fail mathematics
If I do not play football, then I study
But I failed mathematics
Therefore, I play football

b. Let A = {1, 2} and B = {a, b, c}. calculate A X B and A^2



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2019/2020 HARMATTAN SEMESTER EXAMINATION

CSC 207 – DISCRETE STRUCTURE

INSTRUCTION: Answer Question 1 and Attempt any other 3 Questions **Time: 2hours**

1a. Define the following terms:
(iv) Tree (ii) Infinite set (iii) Partition (iv) Contradiction

b. Given K = {1, 2, 3, 4} and J = {X, Y, Z}. Consider the following relations from K to J.
R = {(1, B), (1, C), (3,B), (4, A), (4, C)}
(iv) Determine the matrix of the relations.
(v) Find the inverse relation R^{-1} of R.
(vi) Determine the domain and the range of R.

c. Show by using truth table that the conditional $p \rightarrow q$ and its inverse $(\sim p) \rightarrow (\sim q)$ are not logically Equivalent. (Hint: $p \rightarrow q \neq (\sim p) \rightarrow (\sim q)$)

d Translate into predicate calculus:
∃ Some of the lecturers know the answer
∼ None of the students knows the answer
None of the lecturers is a student

e. Simplify
(i) $A + B(A + B) + A(\bar{A} + B)$
(ii) $f(A, B, C) = \Sigma(0, 2, 4, 5, 6)$

2a. Implement this logic expression using logic diagram: $P = A.B(A + B)$
b. Rewrite the following schemas using existential quantifiers only and universal quantifiers only.
(i) $\forall X (P(X) \rightarrow \exists Y (Q(Y) \wedge R(X, Y))$
(ii) $\sim \forall X \exists Y (F(X, Y) \vee G(X, Y))$

3a. Translate these arguments into symbols, construct appropriate truthtable and test the invalidity.
If I study, then I will not fail mathematics
If I do not play football, then I study
But I failed mathematics
Therefore, I play football
b. Let A = {1, 2} and B = {a, b, c}. calculate A X B and A^2

4a. Prove that A = {2, 3, 4, 5} is not a subset of B = {X : X ∈ N, X is even, X ≤ 15)
b. Prove that $(A \cap B) \cap C = A \cap (B \cap C)$

5a. Given that X = {1, 2, 3, 4, 5} and E = {(1, 3), (1, 4), (2, 3), (3, 5), (5,1), (5, 3)}. Denote G(X, E) using an undirected and a directed graph.
b. What do you understand by matrix representation and give an example.

6a. Simplify the Boolean function in
(i) Sum of products form (ii) product of sums form
F (A, B, C, D) = Σ (0, 1, 2, 5, 8, 9, 10)
b. Define the following graphs:
(i) Complete graph (ii) Regular graph

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2017/2018 HARMATTAN SEMESTER EXAMINATION

CSC 207 – DISCRETE STRUCTURE

INSTRUCTION: Answer Question 1 and Attempt any other 3 Questions

1a. Define the following terms:
(i) Tautology (ii) Contradiction (iii) Logic (iv) Directed graph (v) Undirected graph

b. Let R be the following relation on given A = {1, 2, 3, 4}: R = {(1, 3), (1, 4), (3, 2), (2, 3), (3, 4)}.
(i) Find the matrix M of R
(ii) Find the domain and range of R
(iii) Find R^{-1}
(iv) Draw the directed graph of R

c. Show by using truthtable that the conditional $p \rightarrow q$ and its inverse $(\sim p) \rightarrow (\sim q)$ are not logically equivalent. (Hint: $p \rightarrow q \neq (\sim p) \rightarrow (\sim q)$)

d. (i) Prove that A = {2, 3, 4, } is not a subset of B = {X : X ∈ N, X is even, X
(ii) What do you understand by matrix representation and give an example.
(iii) Let A = {1, 2, 3} and B = {1, 4, 3}, what is A ∩ B and A ∪ B

e. Rewrite the following schemas using existential quantifiers only and universal quantifiers only
(i) $\forall x(P(X) \rightarrow \exists Y (Q(Y) \wedge R(X,Y))$
(ii) $\sim \forall x \exists Y (F(X,Y) \vee G(X,Y))$
(iii) Simplify $A + B(A + B) + A(\bar{A} + B)$

2a. Prove that $(A \cup B)^c = A^c \cap B^c$

b. Translate these arguments into symbols, construct appropriate truthtable and test the validity.
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But I failed mathematics
Therefore, I play football

3a. Define the following terms:
(i) Conjunction (ii) Disjunction (iii) Negation (iv) Conditional

b. Let A = {1, 2} and B = {a, b, c}, what is A X B and B X A.

4a. Translate into predicate calculus:
Some of the lecturers know the answer
None of the students knows the answer
None of the lecturers is a student

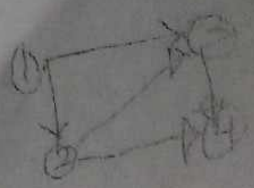
b. Implement this logic expression using logic diagram: $P = A.B(A + B)$

5a. Simplify the Boolean function in
(i) Sum of products form (ii) product of sums form
$F(A, B, C, D) = \Sigma(0, 1, 2, 5, 8, 9, 10)$

b. Define the following graphs:
(i) Complete graph (ii) Regular graph (iii) Isomorphic graph

6a. Draw the graph corresponding to the following sets:
X = {1, 2, 3, 4} and E = {(1, 2), (1, 3), (2, 3), (2, 4), (3, 4)}. Is the graph connected?

b. Rewrite the following schemas using existential quantifiers only and universal quantifiers only.
(i) $\forall x (P(X) \rightarrow \exists Y (Q(Y) \wedge R(X,Y))$ (ii) $\sim \forall x \exists Y (F(X,Y) \vee G(X,Y))$



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2020/2021 HARMATTAN SEMESTER EXAMINATION

CSC 207 – DISCRETE STRUCTURE
INSTRUCTION: Answer Question 1 and Attempt any other 3 Questions **Time: 2hours**

1a. Define the following terms:
(i) Tautology (ii) Contradiction (iii) Logic (iv) Directed graph (v) Undirected graph

b. Given A = {1, 2, 3, 4} and B = {X, Y, Z}. Consider the following relations from A to B.
R = {(1, Y), (1, Z), (3,Y), (4, X), (4, Z)}
(i) Determine the matrix of the relations.
(ii) Find the inverse relation R^{-1} of R.
(iii) Determine the domain and the range of R

c. Show by using truth table that the conditional $p \rightarrow q$ and its inverse $(\sim p) \rightarrow (\sim q)$ are not logically Equivalent. (Hint: $p \rightarrow q \neq (\sim p) \rightarrow (\sim q)$)

d. Write predicate calculus schemas to represent the following statements.
(i) Some of the doctors know the answer.
None of the nurse knows the answer.
None of the doctor is a nurse.
(ii) Either nobody goes or everyone goes
If John goes, Mary will not go.
John will not go.

e. Simplify
(i) $A + B(A + B) + A(\bar{A} + B)$
(ii) $f(A, B, C) = \Sigma(0, 2, 4, 5, 6)$

2a. Implement this logic expression using logic diagram: $P = A.B(A + B)$
b. Rewrite the following schemas using existential quantifiers only and universal quantifiers only.
(i) $\forall \times (P(X) \rightarrow \exists Y (Q(Y) \wedge R(X, Y))$
(ii) $\sim \forall \times \exists Y (F(X, Y) \vee G(X, Y))$

3a. Translate these arguments into symbols, construct appropriate truthtable and test the invalidity.
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4a. Prove that A = {2, 3, 4, 5} is not a subset of B = {X : X ∈ N, X is even, X < 15)
b. Prove that (A n B) n C = A n (B n C)

5a. Given that X = {1, 2, 3, 4, 5} and E = {(1, 3), (1, 4), (2, 3), (3, 5), (5,1), (5, 3)}. Denote G(X, E) using an undirected and a directed graph.
b. What do you understand by matrix representation and give an example.

6a. Simplify the Boolean function in F (A, B, C, D) = Σ (0, 1, 2, 5, 8, 9, 10)
(i) Sum of products form (ii) product of sums form

b. Define the following graphs:
(i) Complete graph (ii) Regular graph (iii) Isomorphic graph