ar: 2021-2022
mester: Fall
ourse Code: MA112
ourse Name: Discrete Mathematics
nstructor: Dr. Ahmed Abdelreheem

الجامعة المصرية للتعلم الإلكتروني الأهلية
THE EGYPTIAN E-LEARNING UNIVERSITY

Exam: Midterm
Date: 5 / 12 / 2021
Exam Time: 60 minutes
Mark: 20

Question One: Multiple Choice. (10 Marks)

1. Let P: This is a great website, Q: You should not come back here. Then 'This is a great website and you should come back here.' is best represented by?
   A. $\neg P \vee \neg Q$
   B. $P \wedge \neg Q$
   C. $P \vee Q$
   D. $P \wedge Q$

2. $P \dashrightarrow R$ is
   A. Tautology
   B. Contradiction
   C. Contingency
   D. none of the above

3. $A \subseteq B$ if and only if the quantification
   A. $\forall x(x \in A \rightarrow x \in B)$
   B. $\forall x(x \in B \rightarrow x \in A)$

4. Let f and g be the functions from the set of integers to the set of integers defined by $f(x) = 2x - 3$ and $g(x) = 3x + 2$. What is the composition of f and g? What is the composition of g and f?
   A. 6x + 7, 6x + 11
   B. 6x + 7, 3x + 11
   C. 6x + 11, 6x + 7
   D. Non of the above

5. let p(x) "x+1=3" and the truth value is true in domain natural numbers. What is the type of quantifier?
   A. Existential
   B. Uniqueness
   C. Both a and b
   D. Universal

6. Find the bitwise "and" 0110 1101 , 1001 0011
   A. 1000 0010
   B. 0001 0000
   C. 1000 0000
   D. 0000 0001

7. Let p and q be the propositions p: It is below freezing. q: It is snowing. Then the statement "It is not below freezing and it is not snowing" is equivalent to which propositions
   A. $\neg p \rightarrow \neg q$
   B. $\neg p \wedge \neg q$
   C. $\neg p \wedge q$
   D. $\neg p \vee \neg q$

8. Let P statement "Maria takes a English course" and q Maria will find a new job . Express the statement P →q as English statement.

A. If Maria takes an English course, then She will find a new job
B. Maria takes an English course and she will find a new job ✗
C. Maria takes an English course but She will not find a new job ✗

9. Let P (x) be the statement "x spends more than five hours every weekday in class," where the domain for x consists of all students. Express ∃xP(x) quantifications in English

A. There is a student who spends more than five hours every weekday in class.
B. Every student spends more than five hours every weekday in class. ✗
C. There is a student who does not spend more than five hours every weekday in class.
D. No student spends more than five hours every weekday in class. ✗

10. Let p, q, and r be the propositionsp: You have the flu.q: You miss the final examination.r: You pass the course.If you have the flu then you'll not pass the course OR If you miss the final examination then you'll fail the course

A. (p → ¬r) ∨ (q → ¬r) $(p \rightarrow \neg r) \vee (q \rightarrow \neg r)$
B. (p↔¬r)∨(q→¬r) ✗
C. (p→¬r)∧(q→r) ✗
D. (p→¬r)∨(q→r)

11. Which of the following propositions is tautology?

p	¬p	q	
T	F	T	T
T	F	F	T
F	T	T	T
F	T	F	F

A. (p ∨ q)→q ✗
B. p ∨ (q→p) ✗
C. p ∨ (p→q)
D. Both (b) & (c)

12. p ∨ q is logically equivalent to

T
T
T
F

A. ¬q → ¬p
B. q → p
C. ¬p → ¬q
D. ¬p → q

13. Let p and q be the propositions p: It is below freezing. q: It is snowing. Then the statement " It is either snowing or below freezing (or both) " is equivalent to which propositions

A. ¬p → ¬q
B. ¬p ∧ q
C. p ∨ q
D. p → q

14. (p → q) ∧ (p → r) is logically equivalent to

A. p → (q ∧ r)
B. p → (q ∨ r)
C. p ∧ (q ∨ r)
D. p ∨ (q ∧ r)

15. Let's consider a propositional language where •p means"Paola is happy", •q means"Paola paints a picture", •r means"Renzo is happy". Formalize the following sentence: ."if Paola is happy and paints a picture then Renzo isn't happy" Then which of these choices express that :

A. p∧q→¬r $(p \wedge q) \rightarrow \neg r$
B. p∧¬q→¬r
C. p∨q→¬r
D. ¬p∨q→¬r

Question Two: True or False. (10 Marks)

1. $\neg(p \rightarrow q)$ and $p \wedge \neg q$ are logically equivalent T

2. Let Q(x, y) denote the statement "X is greater than Y." What are the truth values of Q (6, -6) T

3. $p \leftrightarrow q \equiv (p \rightarrow q) \wedge (q \rightarrow p)$ T

4. If A and B are sets with $A \subseteq B$, then $A \cup B = A$ F

5. The conditional statement $p \rightarrow (p \vee q)$ is a tautology T

6. $\neg \exists x Q(x) \equiv \forall x\, Q(x)$ F

7. $\neg \forall x P(x) \equiv \exists x\, P(x)$. F

8. The Quantifier $\forall x P(x)$ is false, when there is an x for which P(x) is false. T

9. $\neg \forall x P(x) \equiv \exists x\, \neg P(x)$ T

10. The conditional statement $(p \wedge q) \rightarrow p$ is a tautology (T)

11. Determine whether each of these conditional statements is true or false If 3+2=5, then 2+6=4 F

12. If A and B are sets with $A \subseteq B$, then $A \cup B = B$ T

13. Let Q(x, y) denote the statement "x is greater than y." What are the truth values of Q (3, 1) T

14. The conditional statement $\neg p \rightarrow (p \rightarrow q)$ is a tautology (F)

15. $\neg \exists x Q(x) \equiv \forall x\, \neg Q(x)$ T

Good Luck and Best Wishes

Dr. Ahmed Abdelrheem