CSD2259 Homework 2

Due: Feb 4, 2024

The following problem set is used for the on-line homework 2 set up on Moodle. Please key in your answers on Moodle by the due date.
Appreciate if you could let me know typos and errors.

Question 1. Which of the following is proposition?

(a) Do not pass go (b) What time is it?
(c) $4 + x = 5$ (d) The moon is made of green cheese.

(A) Only a (B) Only b (C) Only c (D) Only d (E) None of them

Questions 2-7. Let p, q, and r be the propositions

p: You get an A on the final exam.
q: You do every exercise in this book.
r: You get an A in this class.

Question 2. Which of the following is "You get an A in this class, but you do not do every exercise in this book"?

(A) $r \wedge q$ (B) $r \wedge \neg q$ (C) $r \vee q$ (D) $r \vee \neg q$ (E) None of these

Question 3. Which of the following is "You get an A on the final, you do every exercise in this book, and you get an A in this class"?

(A) $p \wedge q \wedge r$ (B) $p \wedge \neg q \vee r$ (C) $(p \vee q) \wedge r$ (D) $p \wedge q \wedge \neg r$ (E) None of these

Question 4. Which of the following is "To get an A in this class, it is necessary for you to get an A on the final"?

(A) $r \wedge p$ (B) $p \rightarrow r$ (C) $r \rightarrow p$ (D) $\neg p \rightarrow \neg r$ (E) None of these

Question 5. Which of the following is "You get an A on the final, but you don't do every exercise in this book; nevertheless, you get an A in this class"?

(A) $p \wedge q \wedge r$ (B) $p \wedge \neg q \wedge r$ (C) $\neg p \wedge q \wedge r$ (D) $p \wedge q \wedge \neg r$ (E) None of these

Question 6. Which of the following is "Getting an A on the final and doing every exercise in this book is sufficient for getting an A in this class"?

(A) $(p \wedge q) \wedge r$ (B) $(p \wedge q) \vee r$. (C) $p \to r$ (D) $q \to r$ (E) None of these

Question 7. Which of the following is "You will get an A in this class if and only if you either do every exercise in this book or you get an A on the final"?

(A) $(p \vee q) \to r$ (B) $r \to (p \vee q)$ (C) $(p \vee q) \leftrightarrow r$ (D) $p \vee q \vee r$ (E) None of these

Question 8. Which of the following conditional statements is **false**?

(a) If $1 + 1 = 2$, then $2 + 2 = 5$ (b) If $1 + 1 = 3$, then $2 + 2 = 4$

(c) If $1 + 1 = 3$, then $2 + 2 = 5$ (d) If monkeys can fly, then $1 + 1 = 3$

(A) Only a (B) Only b (C) Only c (D) Only d (E) None of them

Question 9. In constructing truth tables for the following compound statements, which table has 8 rows (not including the first one)?

(a) $p \vee q \vee r$ (b) $(p \vee q) \to (\neg p \oplus q)$ (c) $(p \vee \neg r) \wedge (q \vee \neg s)$

(A) Only a (B) Only b (C) Only c (D) Both a and b (E) None of them

Question 10. Which of the following pairs of propositions are **not logically equivalent**?

(a) $\neg(p \vee q)$ and $(\neg p \vee \neg q)$ (b) $\neg(\neg p)$ and p (c) $\neg(p \vee q)$ and $\neg p \wedge \neg q$

(A) Only a (B) Only b (C) Only c (D) All of them (E) None of them

Question 11. Which of the following is a tautology?

(a) $(p \wedge q) \to p$ (b) $\neg p \to (p \to q)$ (c) $\neg(p \to q) \to p$

(A) Only (a) (B) Only (b) (C) Only (c) (D) All of them (E) None of them

Questions 12-13. A compound proposition is **satisfiable** if there is an assignment of truth values to its variables that makes it true.
Remark. A proposition is satisfiable if and only if it is a **tautology** or a **contingency**. A **contradiction** is unsatisfiable.

Question 12. Which of the following statements is satisfiable?

(a) $(p \vee q \vee r) \wedge (\neg p \vee \neg q \vee \neg r)$ (b) $(p \vee \neg q) \wedge (q \vee \neg r) \wedge (r \vee \neg p)$ (c) $(p \vee \neg p) \wedge (q \wedge \neg q)$

(A) Only a (B) Only b (C) Only c (D) Both a and b (E) All of them

Question 13. Which of the following statements is satisfiable?

(a) $(p \vee \neg q) \wedge (\neg p \vee q) \wedge (\neg p \vee \neg q)$

(b) $(p \leftrightarrow q) \wedge (\neg p \leftrightarrow q)$

(A) Only a (B) Only b (C) Both of them (D) None of them (E) *Dummy choice*

Question 14. In the following 2 arguments, denote the left one argument **a** and the right one argument **b**. Which argument is valid?

(1) If Socrates is human, then Socrates is mortal.	(1) If George does not have eight legs, then he is not a spider.
(2) Socrates is human.	(2) George is a spider.
$\therefore$ Socrates is mortal.	$\therefore$ George has eight legs.

(A) Only a (B) Only b (C) Both of them (D) None of them (E) *Dummy choice*

Question 15. The following are premises of some argument.
(1) It is either hotter than 100 degrees today or the pollution is dangerous.
(2) It is less than 100 degrees outside today.
Which of the following can be the conclusion of the argument?
(A) Today is a nice day.
(B) The pollution is not dangerous.
(C) The pollution is dangerous.
(D) If it is hotter than 100 degrees today, then the population is dangerous.
(E) None of these.

Question 16. The following are premises of some argument.
(1) If I work all night on this homework, then I can answer all the exercises.
(2) If I answer all the exercises, I will understand the material.
Which of the following can be the conclusion of the argument?
(A) I work all night on this homework
(B) I will understand the material
(C) If I work all night on this homework, then I will understand the material.
(D) I work all night on this homework and I will understand the material
(E) None of these