Guarantee of Integrity

I'm informed of all the regulations of exams and the corresponding punishments while violating them. I will abide by all the rules for exams and stay honest. Signature: _____

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Examination Paper of Northwestern Polytechnical University

Score:	

1st Semester of the Academic Year 2019-2020

Course School 2019 School of Computer Science

Course Name Discrete Mathmatics

Date of Exam 2019.11.5 Duration and time 2 hours

NOTICE: Write all answers on answer sheet.

I. Choose the right answer（2 points for each, total 30 points）

1. Which one is proposition?
   A. Do not pass go. B. The moon is made of green cheese.
   C. What time is it? D. $4 + x = 5$
2. Let p and q be the propositions
   p: Charry is good at Chinese: q: Charry is good at Mathematics
   Which one represent Charry is good at Chinese and Mathematics?
   A. $p \wedge q$ B. $p \vee q$ C. $p \rightarrow q$ D. $p \leftrightarrow q$
3. Which is not a tautology?
   A. $(p \wedge q) \rightarrow p$ B. $p \rightarrow (p \vee q)$ C. $(p \vee \neg p) \rightarrow F$ D. $F \rightarrow p$
4. Let P(x) denote the statement "$x \leq 4$." What is false?
   A. P(x) B. P(3) C. P(4) D. P(5)
5. Let P(x) denote the statement "x passed the exam", which represent someone in the class passed the exam?
   A. P(David) B. $\exists x P(x)$ C. $\forall x P(x)$ D. $\exists x \neg P(x)$
6. What is the cardinality of $\{\varnothing, \{\varnothing\}\}$?
   A. 0 B. 1 C. 2 D. 3
7. 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?
   A. 5x+5 B. 6x+5 C. 6x+7 D. 6x+11
8. Which of these sentences are propositions?
   A. What's the time? B. I don't know what the time is.
   C. Please check your phone! D. go away!
9. How many rows appear in a truth table for each of these compound propositions?
   $(p \vee \neg r) \wedge (q \vee \neg s)$
   A. 8 B.12 C.14 D.16
10. What is the negation of 1+2=3?
    A. 1+2=3 B. 2+1=3 C. 1+2=4 D. 1+2<>3
11. Which of these sentences is an inclusive or(not exclusive or)?
    A. To enter the country you need a passport or a voter registration card.
    B. Publish or perish.

C. The prerequisite for the course is a course in number theory or a course in cryptography.

D. Play basketball or football

12. Which one is true

A. If 1 + 1 = 2, then 2 + 2 = 5. B. If 1 + 1 = 3, then 2 + 2 = 5.

C. Both A and B are false D. 1+2=?.

~~13. Decide which integer is remainder of -101 mod 11?~~

~~A. -2 B. 2 C. -9 D. 9~~

~~14. Convert the binary expansion of $(1000000001)_2$ into hexadecimal expansion.~~

~~A. $(101)_{16}$ B. $(201)_{16}$ C. $(301)_{16}$ D. $(401)_{16}$~~

15. How many functions are O(x)

a) $f(x) = 10$ b) $f(x) = 3x + 7$ c) $f(x) = x^2 + x + 1$ d) $f(x) = 5 \log x$ e) $f(x) = |x|$

A. 2 B. 3 C.4 D. 5

II. Answer the question(6 points for each, total 30 points)

1. Prove that there are no solutions in integers x and y to the equation $2x^2 + 5y^2 = 14$.
2. Let $A = \{0, 2, 4, 6, 8, 10\}$, $B = \{0, 1, 2, 3, 4, 5, 6\}$, and $C = \{4, 5, 6, 7, 8, 9, 10\}$. Find.

   a) $A \cap B \cap C$. b) $A \cup B \cup C$. c) $(A \cup B) \cap C$. d) $(A \cap B) \cup C$.
3. Let S = {−1, 0, 2, 4, 7}. Find f (S) if

   a) $f(x) = 1$. b) $f(x) = 2x + 1$. C) $f(x) = x^2+2x$

~~4. Find the inverse of 7 modulo 26.~~

5. What is the best order to form the product ABCD if A, B, C, and D are matrices with dimensions 30 × 10, 10 × 40, 40 × 50, and 50 × 30, respectively? How many add operation to get the final result?

III. Proof(8 points for each, total 40 points)

1. Show that $\neg p \rightarrow (q \rightarrow r)$ and $q \rightarrow (p \vee r)$ are logically equivalent.
2. Devise an algorithm that finds the sum of all the integers in a list.
3. Use rules of inference to show that the hypotheses “If it does not rain or if it is not foggy, then the sailing race will be held and the lifesaving demonstration will go on,” “If the sailing race is held, then the trophy will be awarded,” and “The trophy was not awarded” imply the conclusion “It rained.”
4. Prove when $n>4$, $n!$ grows faster than 2^n.
5. If f and $f \circ g$ are one-to-one, does it follow that g is one-to-one? Justify your answer.