**CSE 230 : DISCRETE MATHEMATICS**

**MID TERM EXAMINATION : SUMMER 2018**

**TIME:1 HOUR MARKS:40**

**ANSWER ANY 04 (FOUR) OF THE FOLLOWING 05 (FIVE) QUESTIONS  
[N.B.: TO UNDERSTAND THE QUESTIONS IS A PART OF EXAMINATION]**

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| **NAME:** | **ID:** | **SEC:** |

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| **1.** | **a)** Read the following passage **carefully** and answer the question(s) that follows:  You are on your way to visit your Grandma, who lives at the end of the town. It's her birthday, and you want to give her the cakes you've baked.  Between your house and her house, you have to cross a total of 7 (seven) bridges, However, before crossing each bridge you have to pay a **toll**. But the rule for paying toll is a bit different than the usual payment using coins. The rule is you have to pay **half of what you are carrying** as a toll in each bridge. For example, if you are carrying 8 (eight) cakes, you have give the first toll collector in the first bridge 4 (four) of them. However, you know that when the toll collectors will hear that it’s your grandma’s birthday, each of them will give 1 (one) cake back to you.  How many cakes do you have to leave home with to make sure that you arrive at Grandma's with **exactly** 2 (two) cakes? Explain your answer in **only one line**. | **[3]** |
|  | **b)**Your sock drawer contains **ten pairs of white socks** and **ten pairs of black socks**. If you're only allowed to take one sock from the drawer at a time and you can't see what color sock you're taking until you've taken it, **how many socks do you have to take** before you're guaranteed to have at least one matching pair? | **[7]** |
| **2.** | **a)** Use truth table to establish whether the following statement forms a tautology or a contradiction or neither: **((QᐱR)ᐱ(¬PᐱQ)) ᐱ¬Q** | **[5]** |
|  | **b)** Without using truth table prove whether **(Q↔P)ᐱ(¬P→Q)** is logically equivalent to **PᐱQ**. | **[5]** |
| **3.** | **a)** Let P(*x*) be the statement **“*x+1>2x*”**. If the domain consists of all integers, what are the truth values of the following ?  i) Ǝ*x*¬P(*x*)  ii) ¬∀*x*P(*x*) | **[4]** |
|  | **b)** Express the following sentences using Predicates and Quantifiers **(You have to state necessary propositions first** ) :  i) All hummingbirds are richly colored and small in size.  ii) No student in your class have got A in Calculus but some of them got A in discrete mathematics.  iii)Every student in your class uses either smartphones or iphones but not both. | **[6]** |
| **4.** | a) Prove that **square root of 7** is irrational by giving a proof by contradiction. | **[5]** |
|  | b) Prove that, if **2n2+4n+7** is even then **n** is not an integer. | **[5]** |
| **5.** | 1000 students went to a school carnival. 30 had a hamburger, soft drink and  ice-cream. 240 had hamburgers. 50 had a hamburger and a soft drink. 330 had soft  drinks. 100 had a soft drink and ice-cream. 380 had ice-cream. 80 had a hamburger  and ice-cream. **How many of them had nothing?** | **[10]** |