CSE 230 : DISCRETE MATHEMATICS
FINAL TERM EXAMINATION : FALL 2018
TIME: 2 HOURS MARKS: 100

ANSWER ANY 10 (TEN) OF THE FOLLOWING 12 (TWELVE) QUESTIONS

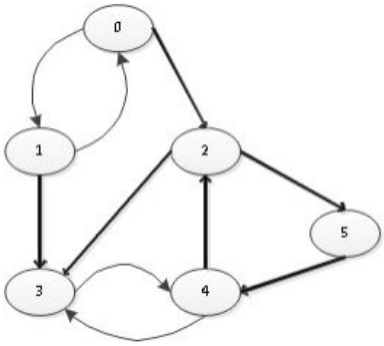
[N.B.: TO UNDERSTAND THE QUESTIONS IS A PART OF EXAMINATION]

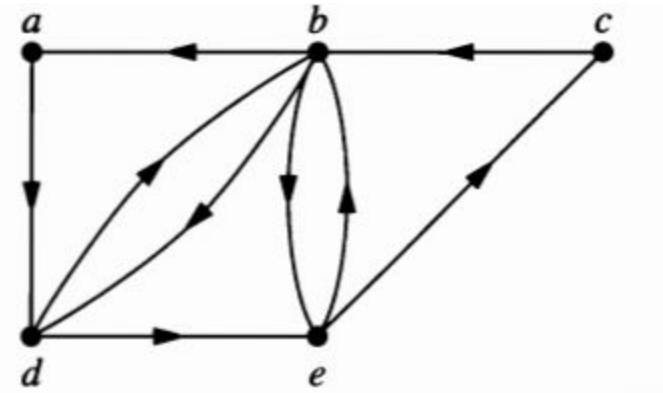
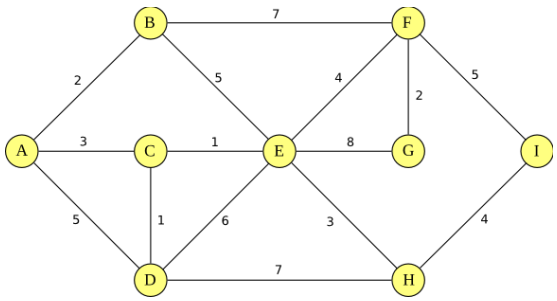
Set-A

NAME:	ID:	SEC:

1.	**a)**	Three cannibals and three anthropologists have to cross a river. The boat they have is only big enough for two people. The cannibals will do as requested, even if they are on the other side of the river, with one exception. If at any point in time there are more cannibals on one side of the river than anthropologists, the cannibals will eat them. What plan can the anthropologists use for crossing the river so they don't get eaten? **Note:** One anthropologist can not control two cannibals on land, nor can one anthropologist on land control two cannibals on the boat if they are all on the same side of the river. This means an anthropologist will not survive being rowed across the river by a cannibal if there is one cannibal on the other side. **Hint:** Just a graphical representation of your answer is enough. Writing a two-page essay is absolutely not necessary.	[10]
2.	**a)**	A survey of students at a film school revealed the following information. **51** like animated films, **49** like comedy films, **60** like dramatic films, **34** like animated and comedy, **32** like comedy and dramatic, **36** like animated and dramatic, **24** like all three types and **1** does not like any of the three types. **i)** How many like only one of the three types of film?	[10]

		ii) How many like animated and comedy but not dramatic?	
3.	**a)**	Define any two of the following terms i) Proposition ii) Tautology iii) Contraposition	[3]
	b)	Prove that if n is an integer and (3n + 2)^2 is odd, then n is odd.	[7]
4.	**a)**	Express the following statements using predicates and quantifiers. i) Every student in your class has a pet ii) Two students in your class has dog iii) Some dogs are not pet	[6]
	b)	Determine the truth value of each of these statements if the domain consists of all real numbers i) $\exists x(x^3 < x^2)$ ii) $\forall x\,((-x)^2 = x^2)$	[4]
5.	**a)**	What sequence of pseudorandom numbers is generated using the linear congruential generator $x_n + 1 = (4x_n + 1)\ mod\ 7$ with seed $x_0 = 3$? Write down your calculations.	[3]
	b)	In each case below, use the Euclidean Algorithm to determine the greatest common divisor of the two numbers. Show all your steps. How many times must division be performed in each example? (This gives an indication of how long it takes to compute the solution.) • 1529 and 14039 • 1529 and 14038	[7]
6.	**a)**	A teacher gives a multiple choice quiz that has 3 questions, each with four possible answers: a, b, c, d. What is the minimum number of students that must be in the class in order to guarantee that at least 3 answer sheets will be identical? Give your answer using the pigeonhole principle.	[7]
	b)	How many ways are there to select a first-prize winner, a second-prize winner, and a third-prize winner from 50 different people who have entered a contest?	[3]
7.	**a)**	Expand the following expression: $(1 - x + x^2)^4$ **Hint:** You can use the Binomial Theorem to expand the expression.	[10]
8.	**a)**	In how many ways can a set of three odd integers between 0 and 100 be	[3]

		chosen?	
	b)	Suppose your teacher make a quiz of 25 **true/false** questions. Unfortunately you was sick in last week and having no idea about the questions. Your teacher gives a hint that, 11 of the answers are **true**. Find the number of ways you can answer the quiz. [you have to answer all the questions]	[7]
9.	**a)**	Suppose, you are planning to visit Bandarban and conquer some high peaks in Bangladesh. Some of the peaks are - Saka Haphong(1063m), Zow Tlang(1021m), Dumlong(1010m), Keokradong(974m), Jogi Haphong(967m). i) Find out the sample space for visiting any of the 3(three) peaks from above mentioned peaks. ii) Find the probability of visiting second highest peak provided that you will also visit the highest peak if you plan to visit 3 peaks in your tour.	[6]
	b)	What do you mean by dependent and independent event? Briefly explain with example.	[4]
10.	**a)**	Rubel and Shakib went to the Casino to play Roulette. Shakib wanted to bet only in the numbers and a roulette takes bet on 36 numbers in total. Shakib new that Rubel's predictions are mostly accurate. Rubel can predict 4 out of 5 times correctly. Gambling on this fact Shakib asks Rubel to choose a number and Rubel does so. What are the chances of Shakib winning the bet.	10
11.	**a)**	 The above figure is a graphical representation of a directed graph. Represent the graph using adjacency matrix.	[7]
	b)	Write the difference between a 'Simple graph' and a 'Pseudograph'.	[3]
12.	**a)**	Consider the following graph G	[3]

		 Check if G contains Euler circuit, Euler path, and/or Hamiltonian circuit.	
	b)	Find the shortest path from node A to node I in the following weighted graph using Dijkstra Algorithm. Clearly show the steps to discover the shortest path. 	[7]