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]

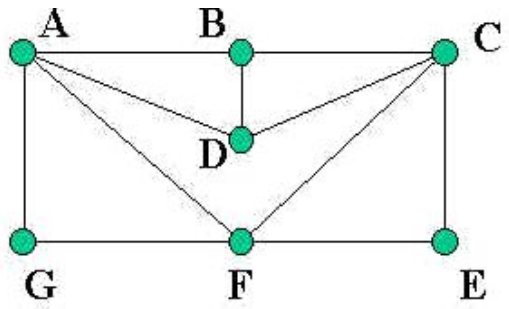
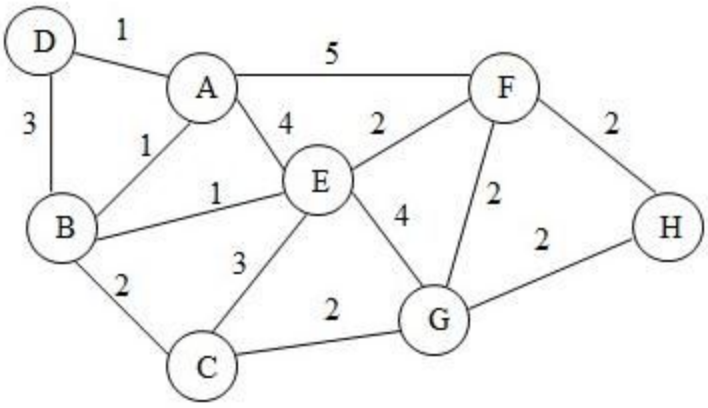
Set-B

NAME:	ID:	SEC:

1.	**a)**	You are walking in a labyrinth and all of a sudden you find yourself in front of three possible roads: the road on your left is paved with gold, the one in front of you is paved with marble, while the one on your right is made of small stones. Each street is protected by a guardian. You talk to the guardians and this is what they tell you: • **The guardian of the gold street:** "This road will bring you straight to the center. Moreover, if the stones take you to the center, then also the marble takes you to the center." • **The guardian of the marble street**: "Neither the gold nor the stones will take you to the center." • **The guardian of the stone street:** "Follow the gold and you'll reach the center, follow the marble and you will be lost." **Given that you know that all the guardians are liars**, can you choose a road being sure that it will lead you to the center of the labyrinth? If this is the case, which road you choose?	[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? **ii)** How many like animated and comedy but not dramatic?	[10]

3.	**a)**	Consider a propositional language where you have the following statements: **A** = *"Angelo comes to the party",* **B** = *"Bruno comes to the party",* **C** = *"Carlo comes to the party",* **D** = *"David comes to the party".* Formalize the following sentences: **i)** Carlo comes to the party provided that David doesn't come, but, if David comes, then Angelo doesn't come. **ii)** A necessary condition for Angelo coming to the party, is that, if Bruno and Carlo aren't coming, Davide comes	[4]
	b)	Let m,n ∈ N. Prove that if m + n < 100, then either m < 50 or n < 50. What type of proof did you use?	[6]
4.	**a)**	Translate the following sentences i) All Slytherins are losers. ii) All Gryffindors who likes Ravenclaw are stupid iii) If you like Hufflepuff and Ravenclaw both then you are not a Gryffindor iv) You will always find at least one Ravenclaw who loves Slytherin and Gryffindor.	[6]
	b)	i) State whether the following expression is true or false while the domain is all Real number $\forall x \exists y ((x < 0) \wedge (y < 0) \wedge (xy > 0))$ ii)Let P (x, y) denote "x is a factor of y" where x ∈ {1, 2, 3, . . .} and y ∈ {2, 3, 4, . . .}. Let Q(y) denote "$\forall x$P (x, y) → ((x = y) ∨ (x = 1))". When is Q(y) true?	[4]
5.	**a)**	Calculate the following and answer (103 (mod 17))*(42 (mod 17)) (mod 17)	[3]
	b)	Decrypt the following sentence using Caesar Cipher where the key=8 I oqnb bw bpm nwma wn Uwzlwz. Epg vwb cam bpqa Zqvo?	[3]
	c)	Congratulations!! You have won a prize for discovering a new number system that is of base 6. This is one step closer to achieving world peace. But before that we need a quick conversion of the following number in your new found numbering system. Convert 127842.	[4]

6.	**a)**	Suppose, you need to form a football team from 2(two) goalkeepers, 5(five) defenders, 5(five) midfielders and 3(three) forwards. How many starting XI can you form so that 1(one) midfielder and 1(one) forward will always be in the team? [NB: Same selected players from a certain group but in different arrangement will form different starting XI]	[7]
	b)	How many people do you need to be able to say with certainty that two have the same birthday?	[3]
7.	**a)**	Find out the fourth member of following formula after expansion: $(x + 2/x)^8$ **Hint:** You can use any of the known expansion techniques (e.g. Pascal's Triangle, Product Factorization or Binomial Theorem).	[10]
8.	**a)**	A coin is flipped eight times where each flip comes up either heads or tails. How many possible outcomes a) are there in total? b) contain exactly three heads? c) contain at least three heads? d) contain the same number of heads and tails?	[7]
	b)	Suppose that a department contains 10 men and 15 women. How many ways are there to form a committee with six members if it must have more women than men?	[3]
9.	**a)**	A box of chocolates contains 10 black, 8 red and 5 white balls. You have to pick any ball randomly 3(three) times such that - **i)** What you pick you will keep it in the box before next pick **ii)** What you pick you will keep it in your pocket What is the key difference between these two events? Find the probability of picking 3(three) red balls in both cases.	[10]
10.	**a)**	You have been suffering from high fever for almost a week so you decide to go see the doctor. The doctor selects you at random to have a blood test for Chikungunya, which for the purposes of this exercise we will say is currently suspected to affect **1 in 10,000 people in Dhaka**. The test is **99%**	[10]

		accurate, in the sense that the probability of a **false positive is 1%**. The probability of a **false negative is 0%**. What is the probability that you have Chikungunya given that you test positive?	
11.	**a)**	Find the Incidence Matrix of the Graph that demonstrates the following Adjacency Matrix 1 1 1 0 1 0 1 0 0 0 0 1 0 1 1 0 1 0 1 0 1 0 0 1 0 1 0 1 0 1 0 0 0 0 0 0	[10]
12.	**a)**	Considering the following graphs find out whether it contains the Euler Circuit, Euler Path or both. 	[3]
	b)	Find out the shortest distance and paths from A to H .  1.	[7]

8.	**a)**		
8.	**a)**	A coin is flipped eight times where each flip comes up either heads or tails. How many possible outcomes a) are there in total? b) contain exactly three heads? c) contain at least three heads? d) contain the same number of heads and tails?	7
	b)	Suppose that a department contains 10 men and 15 women. How many ways are there to form a committee with six members if it must have more women than men?	3