Q.1.	Which of these sentences are propositions? What are the truth values of those that are propositions? **a)** Boston is the capital of Massachusetts. **b)** Miami is the capital of Florida. **c)** 2 + 3 = 5. **d)** 5 + 7 = 10. **e)** $x + 2 = 11$. **f)** Answer this question.	
Q.2	What is the negation of each of these propositions? **a)** Jennifer and Teja are friends. **b)** There are 13 items in a baker's dozen. **c)** 121 is a perfect square. **d)** Abby sent more than 100 text messages everyday.	
Q.3	Suppose that Smartphone A has 256MBRAMand 32GB ROM, and the resolution of its camera is 8 MP; Smartphone B has 288 MB RAM and 64 GB ROM, and the resolution of its camera is 4 MP; and Smartphone C has 128 MB RAM and 32 GB ROM, and the resolution of its camera is 5 MP. Determine the truth value of each of these propositions. **a)** Smartphone B has the most RAM of these three smartphones. **b)** Smartphone C has more ROM or a higher resolution camera than Smartphone B. **c)** Smartphone B has more RAM, more ROM, and a higher resolution camera than Smartphone A. **d)** If Smartphone B has more RAM and more ROM than Smartphone C, then it also has a higher resolution camera. **e)** Smartphone A has more RAM than Smartphone B if and only if Smartphone B has more RAM than Smartphone A.	
Q.4	Let p and q be the propositions "The election is decided" and "The votes have been counted," respectively. Express each of these compound propositions as an English sentence. **a)** $\neg p$ **b)** $p \lor q$ **c)** $\neg p \land q$ **d)** $q \to p$ **e)** $\neg q \lor (\neg p \land q)$ **f)** $\neg p \to \neg q$ **g)** $p \leftrightarrow q$ **h)** $\neg q \to \neg p$	
Q.5	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. Write these propositions using p, q, and r and logical connectives (including negations). **a)** You get an A in this class, but you do not do every exercise in this book. **b)** You get anA on the final, you do every exercise in this book, and you get an A in this class. **c)** To get anA in this class, it is necessary for you to get an A on the final. **d)** 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. **e)** Getting an A on the final and doing every exercise in this book is sufficient for getting an A in this class. **f)** You will get anA in this class if and only if you either do every exercise in this book or you get an A on the final.	

	Q.6	Construct a truth table for each of these compound propositions. **a)** $((p \rightarrow q) \rightarrow r) \rightarrow s$ **b)** $(p \wedge q) \rightarrow (p \vee q)$
	Q.7	Find the bitwise *OR*, bitwise *AND*, and bitwise *XOR* of each of these pairs of bit strings. **a)** 00 0111 0001, 10 0100 1000 **b)** 11 1111 1111, 00 0000 0000
	Q.8	a) Show that $\neg p \leftrightarrow q$ and $p \leftrightarrow \neg q$ are logically equivalent. **b)** Show that $\neg(p \oplus q)$ and $p \leftrightarrow q$ are logically equivalent.
	Q.9	Determine whether each of these compound propositions is satisfiable. **a)** $(p \vee \neg q) \wedge (\neg p \vee q) \wedge (\neg p \vee \neg q)$ **b)** $(p \vee q \vee r) \wedge (\neg p \vee \neg q \vee \neg r)$
	Q.10	Let *C(x)* be the statement "*x* has a cat," let *D(x)* be the statement "*x* has a dog," and let *F(x)* be the statement "*x* has a ferret." Express each of these statements in terms of *C(x)*, *D(x)*, *F(x)*, quantifiers, and logical connectives. Let the domain consist of all students in your class. **a)** A student in your class has a cat, a dog, and a ferret. **b)** All students in your class have a cat, a dog, or a ferret. **c)** Some student in your class has a cat and a ferret, but not a dog. **d)** No student in your class has a cat, a dog, and a ferret. **e)** For each of the three animals, cats, dogs, and ferrets, there is a student in your class who has this animal as a pet.