City University

Faculty of Science & Engineering

Department of Computer Science and Engineering

Program : B.Sc. in CSE

Midterm Examination Semester: Summer 2018

Course Code: CSE 307 Course Title: Discrete Mathematics

Total Marks: 30 Duration: 1 hour 30 Minutes

Answer any 3(three) questions ***3 X 10 =30***

1 a) Define proposition with example. ***1***

b) Define Conjunction and Disjunction with TRUTH Tables. ***2***

c) Define Exclusive OR, Conditional and Bi-Conditional with TRUTH Tables. ***3***

d) What is compound propositions? Construct the truth table of this compound proposition: $(p \vee \neg q) \rightarrow (p \wedge q)$. ***2***

e) Find the bitwise OR, bitwise AND of the following pairs of bit strings: 1111 0000, 1010 1010 ***2***

2 a) Construct a combinatorial circuit of $(p \wedge \neg r) \vee (\neg q \vee r)$ from input bits p, q, r. ***1***

b) Using truth table verify both of the De Morgan laws. ***2***

c) Show that p $\leftrightarrow$ q and $(p \rightarrow q) \wedge (q \rightarrow p)$ are logically equivalent. ***2***

d) What is Tautology? Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology. ***3***

e) Show that $(p \wedge q) \wedge \neg(p \vee q)$ is a contradiction. ***2***

3 a) Define universal and existential quantifier with notation. ***2***

b) Show that $\neg \forall x(P(x) \rightarrow Q(x)) \equiv \exists x(P(x) \wedge \neg Q(x))$. ***2***

c) Let A={1,2,3}B={a,b,c,d}. Find the cartesian product $(B \times A)$ of B and A. ***2***

d) Let A= { $x | x$ *is odd positive integer less than* 10 X A }. What is the cardinality of A. ***2***

e) Define power set. What is the power set of S= {a,b,c}? ***2***

4 a) Let A={1,3,5}, B={1,2,3}. Find the union and intersection of A and B. Show them using Venn Diagram. ***2***

b) Let A={1,3,5,7,9}, B={2,4,6,8,10}. Show that A and B are disjoint. ***1***

c) Define one to one and onto functions using diagram. ***2***

d) Determine whether the function f from {a,b,c,d} to {1,2,3,4,5} with f(a) = 4, f(b) = 5, f(c) = 1, and f(d) = 3 is one-to-one or not? ***2***

e) Let A = $\begin{bmatrix} 12 & 20 \\ 5 & 2 \\ 10 & 15 \end{bmatrix}$, B = $\begin{bmatrix} 3 & 5 \\ 15 & 8 \\ 3 & 6 \end{bmatrix}$ what is the size of B? Find A+B, A-B. ***3***