RE MID-SEMESTER EXAMINATION, OCTOBER-2017
DISCRETE MATHEMATICS (CSE 1002)

Programme: B.Tech (CSE & CSIT) **Semester: 1st**
Full Marks: 30 **Times: 2 Hours**

Subject/Course Learning Outcome	*Taxonomy Level	Ques. Nos.	Marks
Analyze and Apply rules of logic to distinguish between valid and invalid arguments and prove mathematical statements.	L3, L3, L3,L3, L3,L3 L2,L2, L3,L3, L3,L3	1(a),1(b), 1(c),2(a), 2(b),2(c), 3(a),3(b), 3(c),4(a), 4(b),4(c)	2,2, 2,2, 2,2, 2,2, 2,2, 2,2
Analyze the searching and sorting algorithms and use the growth of functions to study the time complexity of algorithms.	L3, L3, L3	5(a),5(b), 5(c)	2,2, 2

*Bloom's taxonomy levels: Knowledge (L1), Comprehension (L2), Application (L3), Analysis (L4), Evaluation (L5), Creation (L6)

Answer all questions. Each question carries equal mark.

1. (a) Write the negation of the given proposition. 2
'The summer in MAINE is hot and sunny.'

(b) Write the converse, contrapositive and inverse of the given conditional statement. 2
' I come to class whenever there is going to be a quiz.'

(c) Determine the value of x after the given statement 2
'$if\ (1+1=2)\ AND\ (2+2=3)\ then\ x := x+1$',
if $x = 1$ before this statement is encountered in a computer program.

2. (a) Determine whether $(p \to q) \wedge (q \to r) \to (p \to r)$ a tautology is or not. 2

(b) Determine whether $(p \to r) \wedge (q \to r)$ and $(p \vee q) \to r$ are logically equivalent or not. 2

(c) Use rules of inference to show that the hypotheses '*John works hard.*', '*If John works hard, then he is a dull boy.*' and '*If John is a dull boy, then he will not get the job.*' imply the conclusion '*John will not get the job.*' 2

3. (a) Translate the statement into logical expression using predicates, quantifiers and logical connectives. 2

'*Every student in this class has studied Calculus.*'

(b) Translate the statement into English, where the domain for each variable consists of all real numbers. 2

$$\forall x \forall y \exists z (x = y + z)$$

(c) Show that the premises '*No man is an Island.*' and '*Manhattan is an Island.*' imply the conclusion '*Manhattan is not a man.*' using the rules of inference. 2

4. (a) Use a direct proof to show that the square of an odd integer is odd . 2

(b) Prove that if $3n + 2$ is odd then n is odd by the method of contradiction, where n is an integer. 2

(c) Show that if n is an integer and $n^3 + 5$ is odd, then n is even, using a proof by contraposition. 2

5. (a) Search for 7 in the sequence 1, 3, 4, 5, 6, 8, 9, 11 using the binary search algorithm. 2

(b) Use the bubble sort algorithm to sort 3, 2, 4, 1, 5 in increasing order showing the lists obtained at each step. 2

(c) Determine whether $x^2 + 2x + 1$ is $O(x^2)$. 2

End of Questions