

MID SEMESTER EXAMINATION, OCTOBER-2019
DISCRETE MATHEMATICS (CSE 1002)

Programme: B.Tech
 Full Marks: 30

Semester: 1st
 Time: 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 use them to prove mathematical statements.	L1, L3, L3, L2, L2, L3	1(a), 1(b), 1(c), 2(a), 2(b), 2(c)	2, 2, 2, 2, 2, 2
Discuss sets, their various operations and use them to analyze functions and its various concepts as well as study sequences and summation.	L3, L3, L3, L3, L3, L3	3(a), 3(b), 3(c), 4(a), 4(b), 4(c)	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.

- (a) Write the negation of the given proposition 2
'It is below freezing and snowing.'

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

(c) Use a proof by contraposition to prove that if n is an integer and 2
 $n^3 + 5$ is odd, then n is even.
- (a) Translate the following statement into a logical expression using 2
 predicates, quantifiers and logical connectives.
'No large birds live on honey.'

(b) Translate the following logical expression into English, where the 2
 domain for each variable consists of all real numbers.
 $\forall x \forall y \exists z (xy = z)$

- (c) Use rules of inference to show that the premises 'If it does not rain or if it is not foggy, then the sailing race will be held and the life saving demonstration will go on,' 'If the sailing race is held, then the trophy will be awarded,' and 'The trophy was not awarded,' imply the conclusion 'It rained.' 2
3. (a) Determine whether the following statements are true or false. 2
 (i) $0 \in \phi$ (ii) $\{\phi\} \in \{\phi\}$
- (b) Show that if A and B are sets, then $(A \cap B) \cup (A \cap \bar{B}) = A$. 2
- (c) Evaluate $\sum_{i=0}^2 \sum_{j=0}^3 ij$. 2
4. (a) Let $f(x) = x + 1$ be a function from the set of integers to the set of integers and let $g(x) = x^2$ be another function from the set of integers to the set of integers. Find $(f \circ g)(x)$ and $(g \circ f)(x)$. 2
- (b) Determine whether the given function is a bijection from R to R 2

$$f(x) = -3x + 7$$
- (c) Prove or disprove that $\lfloor x + y \rfloor = \lfloor x \rfloor + \lfloor y \rfloor$ for all real numbers x and y . 2
5. (a) Use the bubble sort algorithm to sort 6,2,3,1,5,4 showing the lists obtained at each step. 2
- (b) Determine whether $5 \log x$ is $O(x)$. 2
- (c) Show that $x^2 + 1000$ is $\Omega(x^2)$. 2

End of Questions