BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: BE
BRANCH: CSE

SEMESTER: III
SESSION : MO/2018

SUBJECT : CS4101-DISCRETE MATHEMATICS STRUCTURE

TIME: 1.5 HOURS

FULL MARKS: 25

INSTRUCTIONS:
1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

Q1 (a) What is a statement? [2]
(b) Write the negations of the following statements: [3]
i) Raju plays cricket on Sunday and Sachin do walking on Saturday.
ii) $5 < x < 20$.
iii) If n is divisible by 6 then n is divisible by 2 and n is divisible by 3.

Q2 (a) Use the Principle of Mathematical Induction to verify that, for **any positive integer** n, $6^n - 1$ **is divisible by 5.** [5]

Q3 (a) Express the statement "there is a number x such that when it is added to any number, the result is that number, and if it is multiplied by any number, the result is x" as a logical expression. [2]
(b) Without using truth tables, prove that $\sim(p \vee (\sim p \wedge q))$ **and** $(\sim p \wedge \sim q)$ **are logically equivalent.** [3]

Q4 (a) In each of the following situation, indicate whether $f=O(g)$ or $f=\Omega(g)$ or $f=\Theta(g)$ and justify your answer. [5]
i) $f(n) = n \log n$, $g(n) = 10n \log 10n$
ii) $f(n) = n-100$, $g(n) = n-200$

Q5 (a) What is the difference between a relation and a function? Give an example of a relation which is not a function. [2]
(b) Define Transitive closure. Find the transitive closure of the following relation [3]
R={(1,1), (1,2), (2,2), (2,4), (3,2), (4,1), (4,3)}.

Q6 (a) Give the definition of Equivalence Relation and an example. [2]
(b) Prove that $f(x)=\Theta(g(x))$ if and only if $f(x)=O(g(x))$ and $g(x)=O(f(x))$. [3]

:::: 10/09/2018 E ::::::