Indian Institute of Technology, Guwahati
Department of Computer Science and Engineering
Quiz I
Semester I, 2017-18
CS 202: Discrete Mathematics

Total Marks: 45   Time: 50 Minutes

1. (a) Which of following propositions is correct? Briefly justify your answer. `2`
    - (I) The inverse of the $p \to q$ is logically equivalent to $p \to q$
    - (II) The inverse of the $p \to q$ is logically equivalent to converse of $p \to q$
    - (III) The contrapoisitive of the $p \to q$ is logically equivalent to converse of $p \to q$
    - (IV) The contrapositive of the $p \to q$ is logically equivalent to $p \to q$

   (b) Express the statement "I stay at hostel only if it is raining outside" in terms of propositional variables. `2`

   (c) Let p: Prasoon works late, q: Vikas works late, and r: they will eat at home. Consider the proposition "If Prasoon or Vikas works late, then they will eat at home" Logical expression of the proposition will be: `2`
    - (I) $\neg(p \lor q) \to r$
    - (II) $\neg(p \land q) \to r$
    - (III) $(\neg p \land \neg q) \to \neg r$
    - (IV) $r \to (\neg p \land \neg q)$

   (d) Express in English, the negation of the statement "I will play tennis or work on assignment, but not both". `2`

   (e) Given the proposition "I come by car if and only if it is rainning", write its negation. `2`

   (f) There is a student in this class who does not like non-vegetarian food. Assume domain as all human being. `2`

2. Determine whether $(\neg p \land (p \to q)) \to \neg q$ is tautology. `6`

3. There are two tribes live peacefully on an island. People belonging to tribe 1 always tells the truth, whereas people belonging to the other tribe always lie. You, as a tourist visit the island, and meet two persons, A and B. A Tells you "The two of us always tell the truth". Determine, if possible, which tribe the two persons belong to. `5`

4. Is the assertion "This statement is false" a proposition? Justify your answer in maximum 2 sentences. `2`

5. Is the assertion "SpaceX will establish human colony on Mars by 2050" a proposition? Justify your answer in maximum 2 sentences. `2`

6. State the converse, contrapositive, and inverse of the conditional statement: "I come to class whenever there is going to be a quiz". `6`

7. Write logical expressions using predicates, quantifiers and logical connectives in two ways. First assuming domain consists of the students in this class and Second, assuming all people. Statement is "No student in this class has visited Bhutan". `4`

8. Write the negation of statement using predicates, quantifiers and logical connectives. The expression must be written in a manner that the negation should not precede quantifiers, i.e., there should be no negation mark before quantifiers. Statement is "There is no one in this class who knows French and Russian". `4`

9. Translate $\exists p(F(p) \land B(p)) \to \exists j L(j)$ into English, where F(p) is "Printer p is out of service", B(p) is "Printer p is busy", L(j) is "Print job j is lost", and Q(j) is "Print job j is queued". `4`

Rough Work