

**AUTUMN MID SEMESTER EXAMINATION-2017**

**DISCRETE MATHEMATICAL STRUCTURES**

**[MA-2003]**

**Full Marks:25 Time:1Hrs 30 Mins**

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| 1. |  | Answers all. | [1x5] |
|  | a. | Let and be the propositions;  : I bought a lottery ticket this week. : I won the million dollar jackpot.  Express the proposition as an English sentence. |  |
|  | b. | Find the truth value of) if truth value of is False. |  |
|  | c. | Find the truth value of each of the following conditional statements.  (i) If monkeys can fly, then 1 + 1 = 3. (ii) 0 *>*1 if and only if 2 *>*1. |  |
|  | d. | How many reflexive relations are there on a set with *n* elements? How many symmetric relations are there on a set with *n* elements? |  |
|  | e. | What is the reflexive closure of the relation on the set of integers? |  |
| 2. |  |  | [2x2.5] |
|  | a. | Translate each of the following statements into predicated logical expressions.  (i) All of your friends are perfect; (ii) Some mushrooms are poisonous. |  |
|  | b. | Using rules of inference, show that the hypotheses “It is not sunny this afternoon and it is colder than yesterday”, “ We will go swimming only if it is sunny,” “ If we do not go swimming , then we will take a canoe trip”, “If we take a canoe trip, then we will be home by sunset” lead to the conclusion “We will be home by sunset.” |  |
| 3. |  |  | [2x2.5] |
|  | a. | Constructing the truth table, show that is a tautology. |  |
|  | b. | Show that the argument form with premises and and conclusion is valid. |  |
| 4. |  |  | [2x2.5] |
|  | a. | If for ( and) show that . |  |
|  | b. | Prove is divisible by 133 for any non-negative integer by method of induction. |  |
| 5. |  |  | [2x2.5] |
|  | a. | In a survey of 260 student the following data were obtained: 64 had taken computer science course; 94 had taken mathematics course; 58 had taken business course; 28 had taken both mathematics and computer science course; 26 had taken both mathematics and business course; 22 had taken both business and computer science course and 14 had taken all three types of courses.  How many of the student surveyed had taken only a mathematics course? |  |
|  | b. | Let *R*1 be the “less than” relation on the set of real numbers and let *R*2 be the “greater than” relation on the set of real numbers, that is, and What are , *R*1 − *R*2, *R*2 − *R*1, and ? |  |
| 6. |  |  | [2x2.5] |
|  | a. | List the ordered pairs in the equivalence relation *R* produced by the partition and of . |  |
|  | b. | Let be an integer with . Show that the relation is an equivalence relation on the set of integers. |  |