BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
Second Semester - 2022-2023
SYMBOLIC LOGIC HSS F236
Comprehensive Examination (Closed Book)

Date: 16-05-2023

Max Marks 80.0
Duration 3 Hours

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Instructions: Do not use symbols other than the specified truth-functional connectives; no binary language. No marks, if the syllogism is not standard form. Attempt all parts of a question at one place.

1. Explain the two methods of *reductio ad absurdum* and differences between them in terms of their usage. [10]

2. Discuss the process of symbolization of the four traditional subject-predicate propositions with examples in quantification theory and explain the 'opposition' among them. [10]

3. Symbolize the arguments and either construct a formal proof of validity (no other method of proof) or prove invalidity by the method of assigning truth values. [12]

   (i) If the king does not castle and the pawn advances, then either the bishop is blocked or the rook is pinned. If the king does not castle, then if the bishop is blocked, then the game is a draw. Either the king castles or if the rook is pinned, then the exchange is lost. The king does not castle and the pawn advances. Therefore, either the game is a draw or the exchange is lost. (K, P, B, R, D, E)

   (ii) If Alice buys a scooter, then Betty buys a car. If Charles repairs cars, then Dennis repairs scooters. Either Betty buys a car or Charles repairs cars. Therefore, either Alice buys a scooter or Dennis repairs scooters. (A, B, C, D)

4. Rewrite it into the standard form categorical syllogism, write its mood, figure and test its validity or invalidity by Venn diagram. Specify fallacy(ies), if invalid. [6]

   Not any person whose primary interest is in winning elections is a true liberal because all active politicians are people whose primary interest is in winning elections, and any true liberal is not an active politician.

5. Symbolize and prove the validity or invalidity of the following quantified arguments. [12]

   (i) All diplomats are public servants. Some diplomats are eloquent. All eloquent public servants are orators. Therefore, some diplomats are orators. (Dx, Px, Ex, Ox)

   (ii) All statesmen are politicians. Some statesmen are intelligent. Some politicians are not statesmen. Therefore, some politicians are not intelligent. (Sx, Px, Ix)

P.T.O.

6. Taking 'diamonds', 'precious stones', and 'gems' as major, minor and middle terms, construct valid syllogisms, two each in third and fourth figures. [8]

7. Symbolize the following statements. (Begin the formula with a quantifier, not with a negation symbol). [10]

   Quantification Theory

   (i) To achieve success, one must work hard if one goes into business, and study continuously if one enters a profession. (Ax, Wx, Bx, Sx, Px)

   (ii) Only citizens of Malaysia can vote in Malaysian elections. (Cx, Vx)

   Logic of Relations

   (iii) Elizabeth introduced her son Charles to everyone.

   (iv) Some things make John happy.

   (v) Someone told nasty stories about someone to everyone.

8. Use shorter truth-table technique to determine whether the following statement forms are tautologous, contradictory or contingent. [6]

   (i) $p \supset [p \supset (q \bullet \sim q)]$
   (ii) $(p \supset q) \equiv [(p \vee q) \equiv q]$

9. Discuss with examples and symbolizations types of reflexive relations. [6]

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