

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

Date: 30-12-2022

Max Marks 80.0
Duration 3 Hours

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. Which truth-functional connectives are devised by using the idea of ‘partial common meaning’? Explain. (10)
2. How is quantification theory an advancement over the propositional logic? Discuss. (10)
3. What is a propositional function? How do we obtain propositions from a propositional function? Explain with examples. (10)
4. Symbolize the arguments and either construct a formal proof of validity (no conditional and indirect proof) or prove it invalid by the method of assigning truth-values. (10)
 - (i) If we buy a lot, then we will build a house. If we buy a lot, then if we build a house we will buy furniture. If we build a house, then if we buy furniture we will buy dishes. Therefore, if we buy a lot, we will buy dishes. (L, H, F, D)
 - (ii) If either it will rain tomorrow or it won’t rain tomorrow, then weather predicting is an exact science. Therefore, weather predicting is an exact science. (R, W)
5. Symbolize and prove the validity or invalidity of the following quantified arguments: (10)
 - (i) No gamblers are happy. Some idealists are happy. Therefore, some idealists are not gamblers. (Gx, Hx, Ix)
 - (ii) No diplomats are extremists. Some fanatics are extremists. Therefore, some diplomats are not fanatics. (Dx, Ex, Fx)
6. 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. (4)

All people who eat least are people who eat most because all people who eat least are people who are most hungry and all people who are most hungry are people who eat most.

7. Determine whether the following are tautologous, contingent or contradictory by the methods indicated: (10)

(i) $\sim (p \equiv \sim q) \equiv \sim (p \equiv q)$ [Shorter truth-table]

(ii) $[(K \bullet L) \vee (\sim K \bullet \sim L)] \vee [(K \bullet \sim L) \vee (L \bullet \sim K)]$ [Truth-table method]

8. If the syllogism has an “I” conclusion, how many valid forms of categorical syllogism are possible? State only the logical skeletons using S, P, M terms. (4)

9. Symbolize the following statements. (12)

Quantification Theory:

(a) Cats and dogs bite if they are frightened or harassed. (Cx, Dx, Fx, Hx, Bx)

(b) Green avocados are never purchased unless all the ripe avocados are expensive.
(Gx, Ax, Px, Rx, Ex)

Propositional Logic:

(c) Three-strikes laws will be enforced and longer sentences imposed only if hundreds of new prisons are built, and that will happen only if taxes are increased. (T, L, H, I)

(d) Cooling a group of atoms to absolute zero and keeping them bunched together is a necessary and sufficient condition for producing a Bose-Einstein condensate.
(C, K, P)

Logic of Relations:

(e) There are some people who do not talk to anyone.

(f) For every person, there is someone who cares for that person.

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