

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
Second Semester - 2021-2022
SYMBOLIC LOGIC HSS F236
Comprehensive Examination (Closed Book)

Date: 06-05-2022

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. “Validity and invalidity are the formal characteristics of arguments”. Discuss and explain two techniques in this context by which we can ascertain validity-invalidity of arguments. (10)
2. What are the quantification rules of Universal Instantiation and Universal Generalization? Discuss and explain the relationship between them. (10)
3. Discuss the paradoxes of material implication. (7)
4. Construct a formal proof (no indirect & conditional proofs) of validity for the following argument. (7)

$$(I \vee \sim \sim J) \bullet K \\ [\sim L \supset \sim (K \bullet J)] \bullet [K \supset (I \supset \sim M)] / \therefore \sim (M \bullet \sim L)$$

5. Symbolize the argument and either construct a formal proof of validity or prove it invalid. (7)

Some diamonds are used for adornment. Only things worn as jewels or applied as cosmetics are used for adornment. Diamonds are never applied as cosmetics. Nothing worn as a jewel that has an industrial application is properly used. Some diamonds have industrial applications. Therefore, some diamonds are not properly used. (Dx, Ax, Jx, Cx, Px, Ix)

6. Symbolize the argument and construct a conditional proof of validity: (7)

If either Jordan or Algeria joins the alliance, then if either Syria or Kuwait boycotts it, then although Iraq does not boycott it, Yemen boycotts it. If either Iraq or Morocco does not boycott it, then Egypt will join the alliance. Therefore, if Jordan joins the alliance, then if Syria boycotts it then Egypt will join the alliance. (J, A, S, K, I, Y, M, E)

7. Rewrite it into standard form categorical syllogism, write its mood, figure and use Venn diagram for testing its validity or invalidity. Specify fallacy(ies), if invalid. (6)

Extremism is always vice because extremism is but another name for fanaticism which is a vice by definition.

P.T.O.

8. Use shorter-truth table method to decide whether the following statement form is tautologous, contingent or contradictory. (6)

$$[p \bullet (q \vee \sim r)] \equiv [((p \bullet s) \bullet (q \vee \sim r)) \vee ((p \bullet \sim s) \bullet (q \vee \sim r))]$$

9. If the syllogism has an “O” conclusion, how many valid forms of the categorical syllogism are possible? State only the logical skeletons using S, P, M terms. (6)
10. Discuss non-transitive and irreflexive relations with examples and their symbolic formulations. (6)
11. Symbolize the following statements. (4)

Quantification Theory:

- (a) There are no happy wanderers.
 (b) It is not the case that every x is made of atoms.

Propositional Logic:

- (c) If John is going to either study or watch TV, then if Mary plays squash only if John plays with her, then Mary will cook and serve dinner. (S,W,M,J,C,D)
 (d) If Alex don't either diet or exercise, he will gain weight.(D,E,G)
12. If A, B, C are false and Y, Z are true statements, determine the truth-value of the compound statement: (4)

$$\{[A \supset (B \supset C)] \supset [(A \bullet B) \supset C]\} \supset [(Y \supset B) \supset (C \supset Z)]$$

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