

Indian Institute of Technology, Kharagpur
Mid-Sem Examination Autumn Semester 2012
Dept. of Humanities & Social Sciences

R

SYMBOLIC LOGIC (HS30068)

Time: 2 hours

Full marks: 60

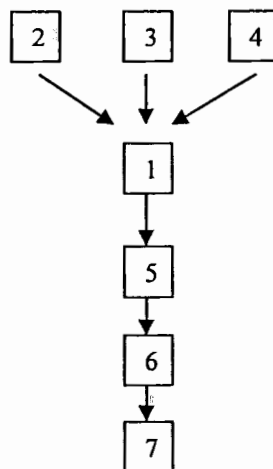
Keep all rough work separate in a right-side margin. No answer will be evaluated twice.

1. True or false? Briefly explain your answer.

1.1. The sentence 'Ajitesh and Nikhilesh are brothers' can be translated as ' $A \bullet N$ ' in Propositional logic.

1.2. The correct logic flow diagram for the passage quoted below is as follows:

The theory of evolution is not acceptable [1]. It is just a hypothesis that has very little supporting evidence [2]. It contradicts common sense, the Bible, and 2nd law of Thermodynamics [3]. It is impossible to believe that something so complex as the eye can come about through random processes [4]. That leaves creationism as the only viable theory on the origin of life [5]. This of course means that God exists [6]. This also means that many biologists are dead wrong [7].



1.3. The following passage is an argument but it is not in standard format: "There is a difficulty with Darwinism, While Lamarckism appears to be not only refutable but actually refuted (because the kind of acquired adaptations which Lamarck envisaged do not appear to be hereditary), it is far from clear what we should consider a possible refutation of the theory of natural selection. If, more especially, we accept that statistical definition of fitness which defines fitness by actual survival, then the survival of the fittest becomes tautological, and irrefutable." (Karl R Popper, *American societies for Experimental Biology*, 1963, Vol. 22: 964)

1.4. 'Logic is topic-neutral' means that logic is unbiased towards all basic cognitive activities.

1.5. The following is a truth-functional claim: "In *The Origin of Species*, Darwin suggested that the variety of life forms can be explained by his Principle of Natural selection".

1.6. The law of excluded middle implies that for any proposition p , $\sim(p \equiv \sim p) \bullet \sim(\sim(p \vee \sim p))$

1.7. The passage quoted in 1.3 contains at least two *guarding terms*.

- 1.8. 'Bread kept in a bread box outside the fridge appears to grow mold quicker than bread kept in the fridge. Temperature determines the mold growth' is an example of abductive reasoning.
- 1.9. The argument 'All winged creatures are mammals. For, all mammals live on land, and every winged creature live on land' is a sound but invalid deductive argument.
- 1.10. The post-Renaissance interest in Mathematics was one of the factors behind the fall of Aristotelian Logic. -15-

2. Briefly explain what consistency is as a logical property, and why it may be an important consideration for determining the 'goodness' of arguments. Use truth-table technique to determine whether the given set is consistent:

$$\{\sim[L \vee (H \supset M)], [M \equiv (\sim L \vee \sim H)], [H \equiv (L \vee M)]\}$$

-15-

3. Use the truth-tree method to determine whether the following two statements are logically equivalent. Recover a partial truth-value assignment to demonstrate your claim, if they are not equivalent.

$$(A \supset (B \equiv C)), ((A \supset B) \equiv (A \supset C))$$

-15-

4. Establish the validity of the following argument by constructing formal proof of validity (Do NOT use C.P. or I.P):

Balaji will be called for interview given that Hhealthglow Pharma Company comes to the campus. Either Hhealthglow Pharma Company comes to the campus or Balaji will be called for interview. This implies Balaji will be called for interview. (B, H) -15-

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