

- (v) In the Aristotelian square of opposition, when an I proposition is false, what are the truth values of the corresponding A, E, O propositions?
- (vi) What is the appropriate term for the blank in the following statement?
The theory of value of a commodity was a basis of the economic analysis of Karl Marx.
- (vii) In Boolean algebra what are the answers that you get when the respective operations in the given expressions are carried out?
(a) $x \cdot x$
(b) $x + x$
- (viii) How is a 'scientific community' defined or given meaning in Thomas Kuhn's book 'The Structure of Scientific Revolutions'?
- (ix) Symbolize the following pair of sentences on the basis of the scheme of abbreviation given.
(a) Ali baba cannot solve every problem.
(b) Ali baba cannot solve any problem.
(F: a is a problem, G: a can be solved by Ali baba)
- (x) What is a 'Turing test'? (02 × 10 = 20 marks)

Part II

2. (a) (i) What is meant by the square oppositions of propositions. (02 marks)
(ii) What is the converse of the proposition 'no student is clever' (02 marks)
(iii) In the square of opposition, when the two particular propositions are true what could be said of the truth values of the universal propositions? (02 marks)
- (b) Explain, on the basis of the rules for a valid syllogism, why it is not possible to derive validly a conclusion from two particular propositions. (04 marks)
- (c) Determine whether the following syllogisms are valid or invalid. When the syllogism is invalid state the rule/rules violated and the resulting fallacy/fallacies.
(i) No popular view is sophisticated. Some true views are sophisticated. Therefore some popular views are not true views.
(ii) Most of those who participated are in favour of a 'mixed-economy'. Some of those who participated are Sri Lankans. Therefore Sri Lankans are in favour of a mixed economy. (03 × 2 = 06 marks)
3. (a) Symbolize the following argument giving your schemes of abbreviation and determine its validity by the indirect method of truth tables.
If there is an earthquake the dam cracks and floods occur. There is an earthquake but the floods do not occur. Therefore the dam is strong. (05 marks)
- (b) Symbolize the following argument giving your scheme of abbreviation and determine its validity by derivation.
If Siripala gets the blessings of the gods if the pooja is held then he will win the election. The pooja is not held unless Siripala has time. He has no time. Therefore if Siripala does not win the election, then he will go abroad. (05 marks)
- (c) Symbolize the following argument in terms of the predicate calculus giving your scheme of abbreviation and show its validity by derivation.
If some Sri Lankans are not educated then all Sri Lankans are traditionalists. A few Sri Lankans are rich. Therefore if no Sri Lankans are traditionalists then some rich are educated. (06 marks)

4. (a) Prove the following theorems.

(i) $((P \rightarrow Q) \wedge (Q \rightarrow P)) \rightarrow (P \leftrightarrow Q)$

(ii) $\wedge x (Fx \rightarrow Gx) \rightarrow (\forall x Fx \rightarrow \forall x Gx)$

(02 × 2 = 04 marks)

(b) Symbolize the following arguments in terms of classes giving your schemes of abbreviation and determine their validity using Venn diagrams.

(i) No wealthy is healthy
All non-healthy are miserable
Therefore all wealthy are miserable

(ii) All men are insane
All men depend on food
Therefore some insane depend on food

(03 × 2 = 06 marks)

(c) Symbolize the following arguments giving your schemes of abbreviation and determine their validity by the method of truth trees.

(i) The criminal will escape only if Sherlock Holmes does not act.
Therefore if Sherlock Holmes does not act, the criminal will escape if Watson also does not act.

(ii) Some birds are not parrots.
Parrots speak.
Therefore some birds do not speak.

(03 × 2 = 06 marks)

5. (a) (i) Simplify the following expression using rules of Boolean algebra.

$$f = ABC + \bar{A}B + AB\bar{C}$$

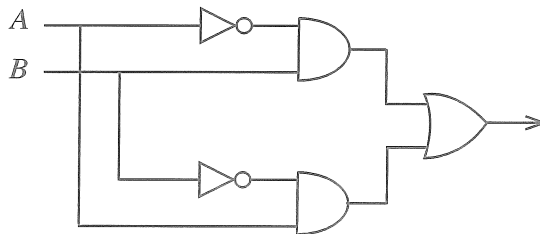
(03 marks)

(ii) Use the K-map to minimize the following expression.

$$\bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}BC + AB\bar{C}$$

(03 marks)

(iii) A, B are two inputs : Write the expression for the following logical gate.



(02 marks)

(b) (i) What is the probability of getting either a double six or a result which gives a total from both dice as 3 when two dice are thrown?

(ii) Calculate the standard deviation of the numbers 1, 2, 3, 4, 5.

(02 × 2 = 04 marks)

(c) (i) Why is sampling usually necessary in social scientific investigation?

(ii) If you want to assess the chances of a certain party winning at a particular general election in the country which of either random sampling or stratified sampling would you use to select a sample for getting their opinions and why?

(02 × 2 = 04 marks)

6. (a) Identify the informal fallacies in the following arguments and explain the way each fallacy occurs.
- (i) University education is useless because most of the graduates are unemployed.
 - (ii) 'A free market economy is the best for this country' wrote film star X who is internationally acclaimed. We should therefore support the political party which advocates a policy of free market economy.
 - (iii) Our cricket team of 1996 was outstanding. A was a member of that team and therefore A was an outstanding cricketer. (02 × 3 = 06 marks)
- (b) (i) Discuss which principle/principles of justice (eg. retributive, reformative) justify capital punishment for
- (1) murder
 - (2) drug dealing.
- (ii) Explain the different types of evidence in courts. (03 × 2 = 06 marks)
- (c) Explain the Liars Paradox. (04 marks)

Part III

7. (a) Distinguish between
- (i) A scientist and a craftsman.
 - (ii) A theoretical scientist and an experimental scientist. (03 × 2 = 06 marks)
- (b) "The demarcation between
- (i) Natural science and social science
 - (ii) Pure science and applied science
- is increasingly getting soft." Make your observations. (02 × 2 = 04 marks)
- (c) Give an example each of
- (i) An observation with instruments
 - (ii) An observation with measurement
 - (iii) An experiment without measurement (01 × 3 = 03 marks)
- (d) What is meant an 'invariant observation language'? (03 marks)
8. (a) "Measurement has become the defining characteristic of modern science".
Make observations on the above statement, taking examples from different sciences. (06 marks)
- (b) How far do a scientist's
- (i) observations
 - (ii) experiments
- depend on theory? Discuss, taking examples related to science. (02 × 2 = 04 marks)
- (c) Discuss the role of analogies and models in the development of science. (06 marks)
9. (a) Distinguish between the empirical generalizations and theoretical generalizations in science. (04 marks)
- (b) Compare and contrast the views of Thomas Kuhn and Paul Feyerabend on the nature and methodology of science. (08 marks)
- (c) "Natural sciences provide explanations, whereas social sciences provide understanding. But explanation is also an attempt to get understanding. Hence both natural science and social science perform the same task". Comment. (04 marks)

- 10.(a) "The broad basic theories in social sciences are very remote from our day to day experiences. Hence the lack of testability in social sciences". Discuss. (06 marks)
- (b) How would you explain the statement that 'psychology is both a natural science and a social science'? (04 marks)
- (c) Write notes on the following.
- (i) Field survey method
 - (ii) Self defeating predictions
 - (iii) Participant observation (02 × 3 = 06 marks)
- 11.(a) (i) Outline the story of the discovery of oxygen and discuss its significance for the development of science.
- (ii) Outline the story of the discovery of the structure of the DNA molecule, and discuss its methodological significance and the far reaching consequences.
- (iii) Does each of the above discoveries mentioned in (i) and (ii) show that science is a collaborative enterprise? Discuss. (03 × 3 = 09 marks)
- (b) (i) What is 'artificial intelligence' Discuss whether it could be a threat to the humans. (03 marks)
- (ii) 'Effective implementation of ethical codes is hardly seen in modern society'. Discuss. (04 marks)

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