නව නිර්දේශය /புதிய பாடத்திட்டம்/New Syllabus

NEW

ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
இலங்கைப் பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2020
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தரப்) பரீட்சை, 2020
General Certificate of Education (Adv. Level) Examination, 2020

තර්ක ශාස්ත්‍රය හා විධික්‍රමය I			පැය දෙකයි
அளவையியலும் விஞ்ஞானமுறையும் I	24 E I		இரண்டு மணித்தியாலம்
Logic and Scientific Method I			**Two hours**

Instructions:

* *Answer **all** questions.*
* *Write your **Index Number** in the space provided in the answer sheet.*
* *Instructions are given on the back of the answer sheet. Follow them carefully.*
* *In each of the questions 1 to **50**, pick one of the alternatives from (1), (2), (3), (4), (5) which is **correct** or **most appropriate** and **mark your response on the answer sheet with a cross** (×) on the number of the correct option in accordance with the instructions given on the back of the answer sheet.*
* *Each question carries **01** marks making a total of **50** marks.*

N.B.

* The symbols for the logical constants and operations used in this paper are only as follows. In answering this paper the symbols should be used accordingly.

In the sentential and predicate calculi

Negation : $\sim$, Implication : $\rightarrow$, Conjunction : $\wedge$, Disjunction : $\vee$, Biconditional : $\leftrightarrow$

Universal quantifier : $\wedge$, Existential quantifier : V

In class logic:

The class union of A and B: $A \cup B$, class intersection: $A \cap B$ or AB, the complement of A: $\bar{A}$, universe class: U, null class: ϕ

In Boolean algebra:

sum: $+$, product: $\cdot$, the complement of X: $\bar{X}$, values 1 and 0.

In Logic gates:

The AND, OR, NOT, XOR gates for the inputs A and B will be respectively shown by $A \cdot B, A + B, \bar{A}, A \oplus B$.

---

1. In the Aristotelian analysis the proposition 'A particular person X was not subjected to quarantine' is
   (1) a universal affirmative.
   (2) a particular negative.
   (3) a universal negative.
   (4) a singular negative.
   (5) a singular affirmative.

2. A star which had been observed by quite a number of European astronomers for about a century from 1690 was observed by William Herschel one night in 1781 using a much improved telescope of his own make. But a problem which he noticed in the appearance of the star made him postpone his decision as to what that object was. The object is planet Uranus. What was the problem that Herschel noticed?
   (1) The weakness of the light emitted by the star
   (2) The star had a square shape
   (3) It appeared to have a disc size unsuitable for a star
   (4) The star did not shine
   (5) The star appeared close to Earth

3. Which of the following gives the necessary and sufficient conditions for a sound argument?
   (1) The argument being valid
   (2) All the premises being true
   (3) The argument being valid and not more than one premise being false
   (4) The argument being valid and all the premises being true
   (5) All premises and the conclusion being true

4. The decision whether a scientific test is an experiment or observation depends on
   (1) the instruments used in the test.
   (2) whether the result of the test is a discovery or an invention.
   (3) whether the object undergoing test has been subjected to any change by the test.
   (4) whether the scientist doing the test has made plans and preparations for the test.
   (5) whether the test process happened accidentally.

5. The necessary condition for a major term of an Aristotelian syllogism is that it should
   (1) be the subject of a proposition.   (2) be the predicate of a proposition.
   (3) be distributed at least once.   (4) not be a subject.
   (5) be undistributed.

6. To which of the following results do the Convex and Concave lenses in an instrument respectively subject light?
   (1) become colourful and dark   (2) Diverge and converge
   (3) Reflect and diffract   (4) Converge and diverge
   (5) Diffract and reflect

7. As seen by the square of oppositions, when an A proposition is false, which of the following options gives the correct sequence of the truth values of the corresponding E, I, O propositions?
   (1) False, Indeterminate, True
   (2) Indeterminate, Indeterminate, True
   (3) Indeterminate, False, True
   (4) Indeterminate, Indeterminate, False
   (5) True, Indeterminate, True

8. The basis of the sequence of elements in Mendeleev's first Periodic Table was
   (1) the temporal sequence of the discovery of each element.
   (2) the ability of the neighbouring elements in the Periodic Table to form chemical compounds.
   (3) the ascending order of the atomic weight of the elements.
   (4) the atomic number of the elements.
   (5) the number of electrons in an atom of each element.

9. The obverse of the proposition 'certain students do not drive vehicles' is
   (1) some drive vehicles.
   (2) all are non-drivers of vehicles.
   (3) some students are non-drivers of vehicles.
   (4) some students do not drive vehicles.
   (5) some who drive vehicles are students.

10. A certain psychiatrist wants to evaluate how far effective a new drug is for neurosia. He uses the following classification in noting down his observations.

Turned very bad	Turned fairly bad	No change	Turned fairly good	Turned very good

What is the scale that this researcher used?
   (1) Nominal scale   (2) Interval scale   (3) Ordinal scale
   (4) Ratio scale   (5) No scale has been used

11. Some Sri Lankans are British citizens.
All Sri Lankans are Sri Lankan citizens.
Therefore some Sri Lankan citizens are British citizens.
The above syllogism
(1) is an unsound argument. (2) is a sound argument.
(3) commits the fallacy of four terms.(4) commits the fallacy of illicit major.
(5) is self contradictory.

12. Who was the person who could get by intuition unknown theorems of pure mathematics and was the first Indian to be a fellow of the British Royal Society?
(1) Sir J.C. Bose (2) Abdul Kalam Azad (3) Sir C.V. Raman
(4) Abdus Salam (5) Ramanujan

13. Which of the following conclusions could you reach if you are given the statements:
'if it rains then the ground gets wet' and 'if it does not rain then the ground gets wet'?
(1) It rains (2) The ground is in a wet zone
(3) The ground gets wet (4) It does not rain
(5) No conclusion can be reached

14. The essence of David Hume's argument against induction is
(1) There is, in general no limit to induction by enumeration.
(2) The argument for the justification of induction commits the fallacy of circularity.
(3) Science should be based on deductive reasoning.
(4) It is wrong for science to come to conclusions based on empirical facts.
(5) It is wrong to conclude that the hypothesis is true just because the prediction is true.

15. If A, B, C are classes and $AB\bar{C} \neq \phi$ then,
(1) $ABC \neq \phi$ (2) $AB \neq \phi$ (3) $AC \neq \phi$ (4) $\overline{ABC} \neq \phi$ (5) $A\bar{B} \neq \phi$

16. Two dice are thrown. What is the probability of number '1' coming up on both dice?
(1) $\frac{23}{36}$ (2) $\frac{5}{9}$ (3) $\frac{4}{9}$ (4) $\frac{1}{18}$ (5) $\frac{1}{36}$

17. Which of the following is the correct truth tree of the argument $(P \leftrightarrow Q) \cdot (P \vee Q) \therefore (P \wedge Q)$?
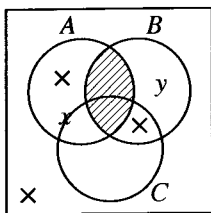

  (1)   (2)   (3)   (4)   (5)

18. What is the standard deviation of the values 3, 4, 5, 6, 7 ?
(1) 1.3 (2) 1.4 (3) 1.5 (4) 2.0 (5) 2.1

19. In the sentence 'Certain girls magnetize the mind.'
(1) The subject is distributed.
(2) The distribution of the terms is indeterminable.
(3) Both the subject and the predicate are undistributed.
(4) All terms are distributed.
(5) Only the subject is undistributed.

20. If the number combinations of 3 students in a class of 12 students is C and the number of permutations of these students taken three at a time is P, how are C and P related?
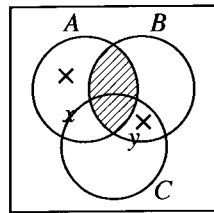
(1) C = P   (2) P = 3C   (3) C = $\frac{1}{2}$ P   (4) 3C = 2P   (5) 6C = P

21. If A, B, C are classes which together do not exhaust the universe and x, y are members of classes then which of the following diagrams represent all these conditions and further that
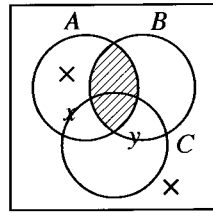$A\overline{B} = \phi$, $A\overline{C} \neq \phi$, $BC \neq \phi$, $x \in A$ and $y \in C$?
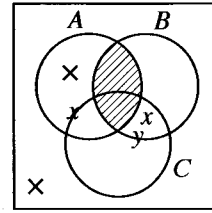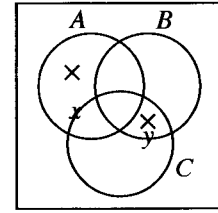

(1)   (2)   (3)   (4)   (5)

22. Who is the distinguished British biochemist who won the applause of the world by his study of the history of science of an Eastern nation and also had relationships with Sri Lanka?

(1) Sir Julian Huxley   (2) H.G. Wells
(3) J.B.S. Haldane   (4) Joseph Needham
(5) Cyril Ponnamperuma

23. The syllogism
   All film stars are popular.
    Some film stars are playful.
   Therefore some playful ones are popular.
is
(1) a valid syllogism in the second figure and the second mood.
(2) a valid syllogism in the fourth figure in the AAI mood.
(3) a valid syllogism in the third figure in the AII mood.
(4) an invalid syllogism in second figure in AII mood.
(5) an invalid syllogism in third figure in the AII mood.

24. If the force applied to a body is increased by uniform values then according to Newton's Second Law of Motion which of the following diagrams show the way in which the body's acceleration changes?
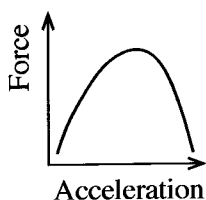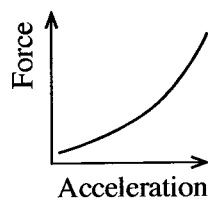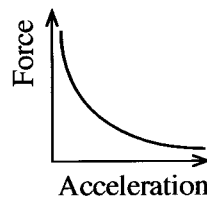
Acceleration (1)   Acceleration (2)   Acceleration (3)   Acceleration (4)   Acceleration (5)
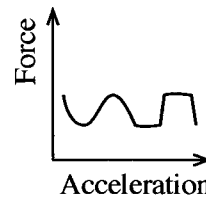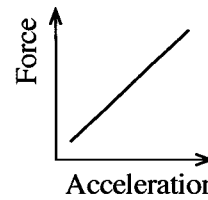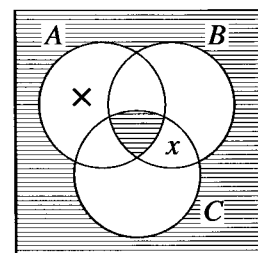
25. If A, B, C in the diagram are classes and if x is a member of a class then
(1) all these classes are empty.
(2) the classes are such that the three of them don't have anything in common or anything outside them when they are taken together.
(3) it is false that each of these classes has members.
(4) the only non-empty class is A.
(5) AB is empty.

26. Who was the outstanding Economist who brought about a revolution in Economics with a book which he published in 1936 which advocated that government should step in with more expenditure, lower taxes, welfare work etc., to pull the economy out from depression and unemployment instead of following traditional laizzez faire economics of government non-interference?

(1) Gunnar Myrdal   (2) John Neville Keynes
(3) John Maynard Keynes   (4) Jaan Tinbergen
(5) Amartya Sen

27. What rule/rules of inference in the system that we use in the proof of the theorem $\sim (P \wedge \sim P)$?

(1) Double negation   (2) Simplification and Adjunction
(3) Adjunction   (4) Simplification
(5) Repetition and addition

28. Which of the following is theoretical?

(1) Acid turns blue litmus red
(2) A loaf of bread weighs less than 400 grams
(3) Neptune
(4) Electrons
(5) The atmospheric pressure on the peak of Pidurutalagala mountain

29. "There is no evidence that any one has seen him after the bush fire. Therefore he is not among the living."

The fallacy in the above argument is

(1) amphiboly.   (2) fallacy of post hoc ergo propter hoc.
(3) appeal to ignorance.   (4) ad hominem.
(5) petitio principii.

30. It is generally considered that Carl Jung moved away from the psycho analytical research that he was doing with Freud due to

(1) Freud's not using behaviouristic methods.
(2) Jung's decision that there is no unconscious.
(3) Jung's non-acceptance of Freud's view that a main factor which leads to neurosia is sex repression in childhood.
(4) The necessity for Jung to come up with the concept of the collective unconscious.
(5) Jung's realization that psycho-analytical methodology is not sufficient for curing mental disease.

31. In which of the following ways could one symbolize the sentence 'None other than a Sri Lankan is eligible to vote' using the scheme of abbreviation

F : a is a Sri Lankan,
G : a is eligible to vote

(1) $\wedge x\,(Fx \rightarrow Gx)$ (2) $\wedge x\,(Gx \rightarrow Fx)$ (3) $\sim\wedge x\,(Fx \rightarrow Gx)$
(4) $\vee x\,(Fx \wedge Gx)$ (5) $\vee x\,(\sim Fx \wedge \sim Gx)$

32. In a certain tropical island in the Pacific Ocean with a multi-ethnic population, 80% of the people live in the villages and 20% in the cities. At a general election A and B were the main parties and the higher percentage of the village population preferred party A while a higher percentage of the city population party B. A newspaper held a pre-election poll by interviewing the random sample of the electorate by mobile phone (and at that time almost all voters in the island had mobile phones) and predicted the outcome of the election but the prediction went wrong. What would you consider was the major mistake in the conduct of the poll?

(1) Method of selection of the random sample.
(2) Not training interviewers sufficiently for the proper conduct of the survey.
(3) There were over forty parties other than A and B contesting in the election.
(4) The random sample was too small.
(5) Not using a stratified sample.

33. The three sentences

$(P \vee (P \wedge Q))$, $(P \wedge (P \vee Q))$, P.

are such that

(1) the first two sentences are logically equivalent and the third one is contradictory to each of the first two.

(2) the last two sentences are logically equivalent and the first one is contradictory to them.

(3) the three sentences are contradictory of each other.

(4) the first and the third one are logically equivalent sentences but the second one is contradictory to either of them.

(5) the three sentences are logically equivalent to each other.

34. What Karl Popper means by the term 'corroborated' in connection with a scientific theory is that

(1) the theory is confirmed.

(2) the theory is true.

(3) the theory has not been falsified by the tests conducted so far.

(4) there is a probability for the theory being true.

(5) now the theory could be accepted.

35. Which of the following is the correct row of values for testing the validity/invalidity of the argument $((P \rightarrow Q) \wedge (\sim P \rightarrow R)) \wedge (Q \vee \sim R) \therefore (R \vee \sim Q)$ by the indirect truth table method.

(1) TTTT   TFTFT   TTTFF   FFFT

(2) TTTT   FTTFT   TTTFF   FFFT

(3) TTFT   FTTFT   TTTFF   FTFF

(4) TTFT   FTTFT   TTFFF   FFTT

(5) TTTT   FTTTF   TTFTF   FFTF

36. Black holes are areas where light can neither enter or get out. But applying the indeterminacy principle of quantum mechanics to the General Theory of Relativity a certain scientist showed in the 1970s that a black hole emits radiation. Who is that scientist?

(1) P.A.M. Dirac

(2) Werner Heisenberg

(3) Wolfgang Pauli

(4) Stephen Hawking

(5) John Wheeler

37.
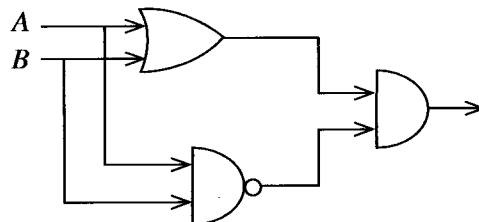
The simplified form of the Boolean expression corresponding to the above logical gate is

(1) $(A \cdot B)$ (2) $(A + B)$ (3) $(A \oplus B)$ (4) $(\bar{A} + \bar{B})$ (5) $(\overline{A + B})$

38. In Thomas Kuhn's view a scientist/scientists gives up one paradigm and accept/accepts a new paradigm because

(1) it is not possible to avoid a hard logical conclusion.

(2) the new paradigm solves all the anomalies that had gathered.

(3) he/they get converted to follow the new paradigm.

(4) the old paradigm will never raise its head anymore.

(5) the new paradigm is more simple.

39.

1.	~~Show~~ $\Lambda x (Fx \rightarrow Gx) \rightarrow (\Lambda xFx \rightarrow \Lambda xGx)$	
2.	$\Lambda x (Fx \rightarrow Gx)$	A^n - for CD
3.	~~Show~~ $(\Lambda xFx \rightarrow \Lambda xGx)$	
4.	ΛxFx	A^n for CD
5.	Fx	4, U.I.
6.	~~Show~~ $(\Lambda x Gx)$	
7.	Fx	5, R
8.	$(Fx \rightarrow Gx)$	2, U.I.
9.	Gx	7, 8, M.P.

The error committed in the above derivation could be corrected by cutting off an unnecessary line. What is the present number of that line?

(NB - of course, once the line is cut off line numbers in the derivation change and the and notation to another line has to be changed. Ignore that.)

(1) 2   (2) 5   (3) 6   (4) 7   (5) 8

40. You are entrusted with conducting an investigation to collect facts for the preparation of a report which would portray the problems that the businesses run by Sri Lankans face after the Corona pandemic. What would be the structure of the sample of subjects that you would interview for this purpose?

(1) A non-stratified random sample of Sri Lankans.
(2) An stratified sample based on provincial representation.
(3) An stratified sample based on the levels of education.
(4) An stratified sample based on ethnic groups.
(5) An stratified sample based on the representation of different types of businesses of Sri Lankans.

41. Going by the laws of Boolean algebra the equivalent of $\overline{(x+y)}$ is

(1) $(\bar{x}+\bar{y})$ (2) $(x+\bar{y})$ (3) $(\bar{x}\cdot\bar{y})$ (4) $(x\cdot y)$ (5) $(x+\bar{x})\cdot y$

42. In Lakatos' methodology the way in which the hardcore of the research programme could be protected is by

(1) making novel discoveries.
(2) avoiding experiments which give results that contradict the hardcore.
(3) revising the protective belt.
(4) accepting the anarchistic nature of methodology.
(5) accepting the theoryladenness of observational statements.

43. When the singular sentence "Raja is mortal" is given, which of the following conclusions could be logically reached according to modern logic?

(1) Some men are mortal.
(2) Raja is a man.
(3) There are mortal things.
(4) There is one man.
(5) No conclusion can be obtained.

44. In his book 'Aganist Method', Feyerabend states that

(1) Galileo did not follow scientific method because he wrote in his mother tongue.
(2) Galileo moved away from scientific method as he used psychological tactics to convert his readers.
(3) The fact that Galileo did not use ad hoc hypotheses was a feature of a good scientific method.
(4) Galileo turned out to be an unsuccessful scientist by removing the hard rational nature from his methodology.
(5) Galileo was a progressive scientist who used various methods and strategies.

45. In which of the following sentences is it necessary to use synonyms to show its analyticity?

(1) $(P \wedge (P \to Q)) \to Q$
(2) All brothers are males
(3) Queen Elizabeth II is identical Queen Elizabeth II
(4) $(P \wedge \sim P)$
(5) All men are men

46. Karl Popper, rejecting induction and outlining his methodology of falsifiability in his book "Logic of scientific Discovery" wrote, "The basis of my proposal is an logical asymmetry that exists between verification and falsifiability; that arises from the logical nature of a universal proposition". How did he present this logical asymmetry?

(1) Although a universal statement is relevant to all the objects in a field, it does not assert an existence.
(2) It is not possible to logically derive a universal statement from singular propositions. But a universal statement might be contradicted by a singular statement.
(3) A universal statement can be metaphysical. But a metaphysical statement cannot be scientific.
(4) The number of implications that could be a derived from a universal statement are infinite. But infinity is not a definite concept.
(5) A universal statement takes a hypothetical form. But the observational sentences are categorical.

47. Giving capital punishment for a person found guilty of murder is best considered justifiable as
(1) deterrent and retributive punishment.
(2) deterrent and rehabilitative punishment.
(3) rehabilitative and retributive punishment.
(4) reformative and deterrent punishment.
(5) reformative and rehabilitative punishment.

More Past Papers at
tamilguru.lk

48. Which of the following is a theorem?
(1) $((P \wedge Q) \leftrightarrow P)$
(2) $((P \to Q) \to Q)$
(3) $\Lambda x (Fx \to Gx) \to (VxFx \to VxGx)$
(4) $(VxFx \to \Lambda yFy)$
(5) $(\sim P \vee Q) \to (P \to \sim Q)$

49. Which of the following is the correct truth-tree to test the validity of the argument "Rabbits have horns. Those which have horns fly. Therefore rabbits fly."?
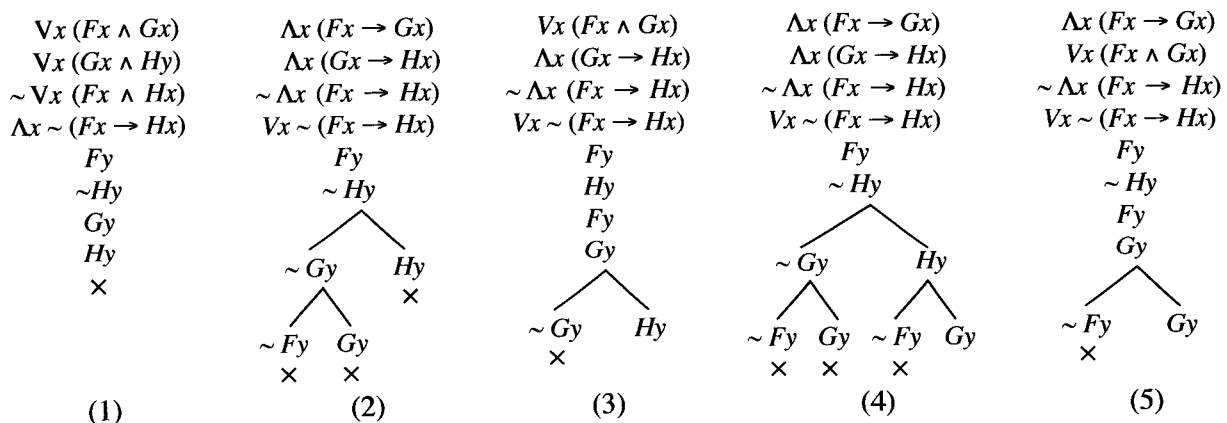
50. By what following term are the people who spread in Sri Lanka from about 40,000 BC known?
(1) Dravidians
(2) Aryans
(3) Balangoda man
(4) Yakkhas
(5) Veddas

* * *

නව නිර්දේශය/புதிய பாடத்திட்டம்/*New Syllabus*

NEW

Department of Examinations, Sri Lanka

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2020
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2020
General Certificate of Education (Adv. Level) Examination, 2020

තර්ක ශාස්ත්‍රය හා විද්‍යාත්මක ක්‍රමය	**II**
அளவையியலும் விஞ்ஞானமுறையும்	**II**
Logic and Scientific Method	**II**

24 **E** **II**

පැය තුනයි மூன்று மணித்தியாலம் ***Three hours***	අමතර කියවීම් කාලය - මිනිත්තු 10 යි மேலதிக வாசிப்பு நேரம் - 10 நிமிடங்கள் **Additional Reading Time - 10 minutes**

Use additional reading time to go through the question paper, select the questions you will answer and decide which of them you will prioritise.

Instructions:
* *Number of questions that should be answered – 06*
* *The question in the Part I is compulsory.*
* *In addition answer **five** questions selecting **at least two** questions from each of the Parts **II**, and **III**.*

N.B.

* The symbols for the logical constants and operations used in this paper are as following. In answering this paper, the symbols should be used accordingly.

In the sentential and predicate calculi:

Negation: $\sim$, Implication: $\rightarrow$, Conjunction: $\wedge$, Disjunction: $\vee$, Biconditional: $\leftrightarrow$

Universal quantifier: Λ, Existential quantifier: V

In class logic:

The class union of classes A and B: $A \cup B$, class intersection: $A \cap B$ or AB, the complement of A: $\overline{A}$, universe class: U, null class: ϕ

In Boolean algebra:

sum: $+$, product: $\cdot$, the complement of X: $\overline{X}$, values 1 and 0.

In Logic gates:

The AND, OR, NOT, XOR gates will be for inputs A and B are shown by $A \cdot B$, $A + B$, $\overline{A}$, $A \oplus B$.

* The candidate is advised **not** to use any other symbols for logical constants or operations.
* The candidate should **not** use theorems (e.g. De Morgan theorem)in derivations except when the theorem itself has been proved by the candidate.

Part I

1. (i) Is the following statement correct or incorrect?
   "The premises and the conclusion of an invalid argument could be true."

   (ii) How would you verbally express as a percentage the fact that the chances of X
      (a) winning the election
      (b) losing the election
   are more?

   (iii) Write the appropriate word that would fill the blank in the statement
   "within the universe of discourse a class and its complement are mutually exclusive and together......"

   (iv) If the velocity v of an object is given in terms of kilometres per hour as v km/h what way would you express its acceleration a in terms of metres (m) and seconds (s)?
   (km = kilometre, h = hour, m = metre, s = seconds)

(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) $\wedge x\,(Fx \rightarrow Gx) \rightarrow (\vee xFx \rightarrow \vee xGx)$ *(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.

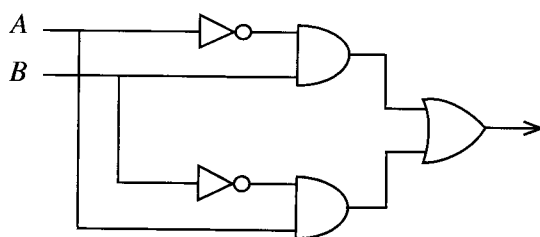 $f = ABC + \bar{A}B + AB\bar{C}$ *(03 marks)*

    (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 Feyeraband 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)

* * *

More Past Papers at
tamilguru.lk