**Please use this answer booklet to write your answers**



**Villa College**

**FINAL EXAMINATION**

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| **UWE student ID** |
| 21076183 |

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| **Program** | **Intake** |
| BSc (Hons) Computer Science | September 2021 |

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| Student ID Number | S | 2 | 1 | | 0 | 1 | | 7 | 5 | 5 |
| Learning Centre | Hulhumale' Campus | | | | | | | | | |
| Module Code | U | F | C | | F | A | | 3 | 30 - | 1 |
| Module Name | INTRODUCTION TO ARTIFICIAL INTELLIGENCE | | | | | | | | | |
| Examination Date | 10th May 10, 2022 | | | Session | | | (Morning/Afternoon/Night) | | | |
| Examination Venue | Online | | | | | | | | | |

Answer booklet

**A1.**

**a)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A | B | A∧B | B→A∧B | A→B→A∧B |
| T | T | T | T | T |
| T | F | F | T | T |
| F | T | F | F | T |
| F | F | F | T | T |

A→(B→(A∧B)) produces all true values and therefore it is a tautology.

**b)**

|  |  |  |
| --- | --- | --- |
| P | Q | P⇒Q |
| T | T | T |
| T | F | F |
| F | T | T |
| F | F | T |

|  |  |  |  |
| --- | --- | --- | --- |
| P | Q | P∧Q | P⇒P∧Q |
| T | T | T | T |
| T | F | F | F |
| F | T | F | T |
| F | F | F | T |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| P | Q | P∧Q | P→P∧Q | P→Q | P→P∧Q⇔P→Q |
| T | T | T | T | T | T |
| T | F | F | F | F | T |
| F | T | F | T | T | T |
| F | F | F | T | T | T |

For (P→ (P ∧ Q)) ⇔ (P → Q) both truth tables produce the same truth values, therefore it is a tautology.

Answer booklet

**A2.**

**{U → R, (R ∧ S) → (P ∨ T), Q → (U ∧ S), ¬T, Q} ⊢ P**

1. U → R Premise

2. (R ∧ S) → (P ∨ T) Premise

3. Q → (U ∧ S) Premise

4. ¬T Premise

5. Q Premise

6. ¬T → P Assumption for Indirect Proof

7. U ∧ S ∨ P Associative

8. R, 7, Simplification

9. R ¬T Modus Tollens

10.¬T ∧ ¬P 4,6, Contradiction

11.¬ (T∨ P) 10, DE Morgan’s Law

12.T ∧ ¬ (¬P), 2,11 Double negation

13.T (R¬P), 7, Simplification

14.R∧ S Identity

15.4 11, 14 Contradiction

16.P

Answer booklet

**A4.**

**a)**

(A∩B)UB = B∩A Verified

Diagram, venn diagram

Description automatically generated

**b)**

**i.**

{ (a,2,c) ,(a,3,c), (b,2,c), (b,3,c) }

**ii.**

Answer booklet

**A6.**

**a)**

i. transitive

ii. symmetric

iii. irreflexive

iv. transitive

b)

i. W is not reflexive as it does not have give reflexive sets for all sets (∀a:𝐴∙(a,a)∈ R)).

ii. W is not irreflexive as has a self loop.

iii. W is not symmetric as as for every (a,b) ∈ R there does not exist (b,a) in the graph.

iv.

Answer booklet

**A7.**

1. Chart, line chart

   Description automatically generated
2. 2 > 3 > 1 > 2
3. 1 > 2 > 4 > 5 > 6
4. 1 > 6 > 5 > 4 > 2 > 3
5. Order of the graph is 6 and degree is 𝛿(10).

Answer booklet

**A8.**

Chart, radar chart

Description automatically generated

Graphs G and G’ are isomorphic and

Answer booklet

**B1**. a (1001011111 – 607)

**B2**. d (can’t be represented)

**B3**. d (can’t be represented)

**B4**. b ({Λ, a2 , ab})

**B5**. d (b1=c987)

**B6**. b (All regular languages can be described by using regular expressions, but some Finite Automata cannot be described by using regular expressions.)

**B7**. a (Backtracking)

**B8**. a ({ cb, bc })

**B9**. c (2)

**B10**. b

**B11**. c ({ anb pa n | n > 1, p > 0 })

**B12**. a (Finite Automata can only have a finite number of states while Pushdown Automata can have an infinite number of states.)

**B13**. c (No, PCs are more powerful than Turing machines are too slow)

**B14**. b (Program A is more efficient than program B.)

**B15**. d ({Λ, 0, 1, 00, 11})

**B16**. b (Λ + a(bb)2)

**B17**. d (S → Λ | abS| bcS)

**B18**. a ((aa+ab+ba+bb)\*)

**B19**. c (Grammar)

**B20**. d (aaabb)