COS10023 Computer and Logic Essentials – Assignment part 1

Teaching Period 1, 2023

Aim

This assessment task allows you to demonstrate your problem-solving ability on problems covering data representation, and sets.

Due date

This assignment is due by **20th March 2023.**

Due date and submission

Each individual student should submit their assignment via Canvas before the deadline. You can submit several times before the deadline; each new submission will overwrite your previous submission. Before submitting the assignment, please ensure that you have undertaken the following activities:

- Checked Canvas for announcements to the assignment and for any updates/clarifications;
- Ensured that the work submitted by you is your original work. If this is not the case, then a penalty will apply. Note this also extends to sharing your original work with other students;
- Reviewed the declaration at https://www.swinburne.edu.au/current-students/manage-course/ exams-results-assessment/submit-work/assessment-declaration/. Electronic submission of your assignment signifies that you agree with this declaration. Note a cover page is not required, however please put your preferred name and student ID on at least the first page, ideally all pages.

If you have exceptional circumstances that mean you are unable to submit the assignment by the due date and time, please contact the convenor as soon as practicable. Note evidence of circumstances will be required.

General instructions

This is an individual assignment. It is preferred that you use word processing software to create your submission; if handwriting is required or preferred please scan your document as a PDF rather than submitting images. Marking scheme Marks will be awarded in accordance with the scheme allocated for each sub-part of the problems as indicated in the assignment. Partial marks will be awarded to the extent that the component parts of the question have been correctly answered. Please note that if a problem requires the answer to be justified, no marks will be awarded for simply giving the correct answer.

Stars

The stars suggest the difficulty of the problem:

* Should be straightforward based on lecture and tutorial material.
**Should be more challenging but still based on lecture and tutorial material.
***Might require some further thought or extra research beyond lecture and tutorial material.

Questions

Important: Your responses to the following questions must show your reasoning (or working out). No marks will be provided for correct answers alone. Non-decimal numbers have a prefix indicating their base.

Data representation (10 marks)

1. [1+1 = 2 marks] *Convert the following unsigned binary numbers to decimal and then decimal to hexadecimal:

   i. 0b 10111101
   ii. 0b 011011101

2. [1+1+2 = 4 marks] Convert the following 16-bit binary string below, determine its value as requested. to two 8-bit signed integers (two's complement) in decimal.

   0b 1011 1101 1001 1100

   i. *Two 8-bit unsigned integers as decimal values.
   ii. **Two 8-bit signed integers (two's complement) as decimal values.
   iii. ***One half-precision (16 bit) floating point value as a decimal value.

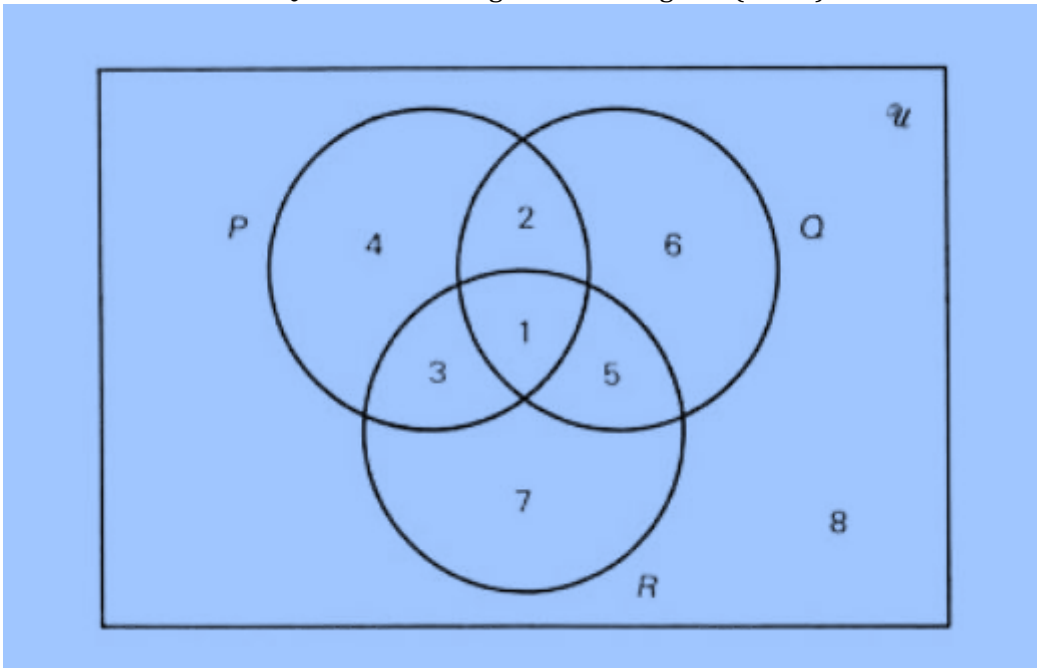
3. [1+1= 2 marks] * Perform the following binary operations. Please write down the steps to get the answer. Correct answer only will be awarded a zero.

   i. 0b 11010101 multiply by 0b 1011
   ii. 0b 1101101010 added to 0b 101010011

4. [2 marks] **Represent the decimal value of -195.85 as an IEEE 754 single precision floating point. Please write your final answer with spaces between the sign, exponent, and mantissa.

Sets (12 marks)

5. [3.5 marks] *Consider the following Venn diagram, which depicts the relationship between three sets, P, Q and R. This diagram has 8 regions (1 to 8).



Identify the regions representing the sets given in the table below.

Sets	**Regions**
$P \cup Q \cup R$	
$P \cap (Q \cup R)$	
$P^c \cup Q^c$	
$(P \cup R)^c$	
$R \cap (P \cup Q^c)$	
$P^c \cap (Q \cup R)$	
$(P^c \cap Q) \setminus R$	

6. [8.5 marks] In Clubs Week, students get the opportunity to join clubs based on their interests. We are interested in exploring patterns around which clubs students are joining. The following data has been calculated for a cohort of 440 students:

* 211 joined the esports club
* 120 joined the aquatics club
* 186 joined the trivia club
* 55 joined the esports and trivia clubs
* 33 joined the aquatics and trivia clubs
* 6 joined the esports, aquatics and trivia clubs
* 46 joined no club

a) [1 mark] * Show how the inclusion/exclusion formula for finite sets can be used to determine the missing value for joining the esports and aquatics clubs.

b) [3 marks] * Draw a Venn diagram with each club as a set and label each part of the diagram with the correct values.

c) [3 marks] * Provide counts for the following. **Show the numerical expression** using the values from the Venn diagram you used to find your answer: correct answers without expressions will be awarded 0 marks.

i. Joined exactly two clubs (not none, not one, not three).
i. Joined aquatics but not esports.
ii. Did not join the trivia club.

d) [1.5 marks] ** Using each club as a set, represent the following using set operators (U, ∩, C or '):

i. Joined both aquatics and esports clubs.
ii. Did not join aquatics nor trivia.
iii. Joined trivia and esports but not aquatics.