



THE UNIVERSITY OF THE WEST INDIES

Semester I ☒ Semester II ☐ Supplemental/Summer School ☐

Mid-Semester Examinations of: October ☒ /February/March ☐ /June ☐ 2018/2019

Originating Campus: Cave Hill ☒ Mona ☒ St. Augustine ☐

Mode: On Campus ☒ By Distance ☐

Course Code and Title: **COMP2201 Discrete Mathematics for Computer Science**

Date: **Thursday, October 18, 2018**

Time:

Duration: **1 Hour.**

Paper No: **1 (of 1)**

Materials required:

Answer booklet: Normal ☒ Special ☐ Not required ☐

Calculator: Programmable ☐ Non Programmable ☒ Not required ☐
(where applicable)

Multiple Choice answer sheets: numerical ☐ alphabetical ☐ 1-20 ☐ 1-100 ☐

Auxiliary/Other material(s) – Please specify:

Candidates are permitted to bring the following items to their desks: Pencil or pen, Ruler, ID card, Exam card

Instructions to Candidates: This paper has 2 pages & 6 questions.

Candidates are reminded that the examiners shall take into account the proper use of the English Language in determining the mark for each response.

All questions are COMPULSORY.

Calculators are allowed.

1. (a) Write the formula to find the number of integer solutions of

$$x_1 + x_2 + x_3 + x_4 = 18$$
subject to $x_1 \geq 0, x_2 > 0, x_3 \geq 2, x_4 > 4$ [1]
 (b) By drawing a Tree Diagram, determine how many bit strings of length four have consecutive 0s? [4]
2. Small board blocks of different colours and varied weights are placed in a bag. The Red block is three times as likely to be pulled as the Orange block and Yellow block. The Yellow block is two times as likely to be pulled as the Green and Blue blocks. Assign probabilities to the five outcomes in the sample space. [4]
3. (a) Use Pascal's triangle to compute the values of

$$\binom{7}{4} \quad \text{and} \quad \binom{7}{5}$$
 [2]
 (b) By using the inclusion-exclusion principle, give a formula for the number of elements in the Union of four sets A_1, A_2, A_3 and A_4 . [2]
 (c) Expand the following expression using the binomial theorem:
 $(5x^3 - 3y)^5$ [3]
4. (a) In a given town only 4 percent of the students will attend a tertiary institution. Find the probability that among 200 students in that town, at least three of them will attend a tertiary institution. [3]
 (b) If a student does not study at all for this COMP2201 Mid-term examination, the probability of passing the examination is 5%. If one studies at an average level, the probability of passing the examination is 56%; whereas if study is done endlessly, the probability of passing the COMP2201 Mid-term examination is 94%. The course lecturer is sure that 12% of students do not study at all, 68% of them study at an average level and 20% of them study endlessly. Given that you pass this COMP2201 Mid-term examination, what is the probability that you studied endlessly? [3]
5. Show that $2n + 4n + 6n + 8n + \dots + (n-2)n + n^2$ is of order n^3 . [4]
6. Consider the recurrence function

$$T(n) = 64T(n/4) + 64n^2$$
Give an expression for the runtime $T(n)$ if the recurrence can be solved with the Master Theorem. Assume that $T(n) = 1$ for $n \leq 1$. [4]

END OF QUESTION PAPER