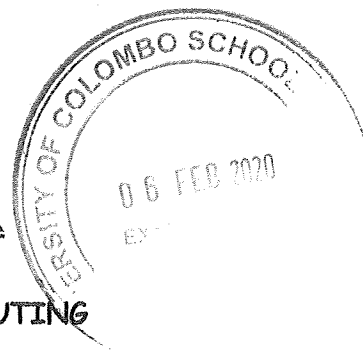




UNIVERSITY OF COLOMBO, SRI LANKA



UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

Academic Year 2016/2017 – Second Year Examination – Semester II – 2019

SCS2210 – Discrete Mathematics II

TWO (2) HOURS

Important Instructions to candidates:

1. The medium of instruction and questions is **English**.
2. **Write your answers in English.**
3. If a page or a part of this question paper is not printed, please inform the supervisor immediately.
4. Note that questions appear on both sides of the paper. If a page is not printed, please inform the supervisor immediately.
5. Write your index number on each and every page of the answer paper.
6. This paper has **4** questions and **02** pages.
7. Answer **ALL** questions. All questions carry equal marks (**25** marks).
8. Any electronic device capable of storing and retrieving text including electronic dictionaries and mobile phones are **not allowed**.
9. **Non-Programmable** calculators are **allowed**.

1. (a) Show that any composite three-digit number must have a prime factor less than or equal to 31.
- (b) Employing the Eratosthenes method, obtain all the primes between 100 and 200.
- (c) A man has 987 oranges. In how many ways can he distribute these among 13 women and 5 children if all women receive equal number of oranges and all children receive equal number of them? (Formulate a suitable linear Diophantine equation and solve it accordingly.)

2. (a) Use congruence relation to prove $41 \mid 2^{20} - 1$.
- (b) Use the Euclidean algorithm to compute $d = \gcd(3672, 1566)$. Write d as an integer linear combination of 3672 and 1566.
- (c) A troop of 17 monkeys store their bananas in 11 piles of equal size, each containing more than one banana, with a twelfth pile of 6 left over. When they divide the bananas into 17 equal piles, none are left over. What is the smallest number of bananas they can have? (Formulate a suitable system of linear congruences and solve it accordingly.)

3. (a) Suppose that a pizza can have non-vegetables toppings and/or vegetable toppings. The non-vegetables toppings can be fish, chicken, sausage, and hamburger; and the vegetable toppings can be tomato, mushroom, pickle, onion, green pepper and olive. A pizza can have from zero to all ten of these toppings.
 - i. How many different pizzas can be ordered?
 - ii. How many different pizzas contain no vegetables?
 - iii. How many different pizzas contain at most one non-vegetables topping?
- (b) A collection of at least three yellow flags, three blue flags, three maroon flags, three red flags, and three green flags is available.
 - i. How many ways are there to arrange three colored flags (without repetition) in a row?
 - ii. How many ways are there to choose three colored flags (with repetition) from the collection?

4. (a) Find the next two terms in the sequence $3, 5, 11, 21, 43, 85, \dots$. Then give a recursive definition for the sequence. Finally, use the characteristic root technique to find a closed formula for the sequence.
- (b) Let a_n be the number of $1 \times n$ tile designs you can make using 1×1 squares available in 4 colors and 1×2 dominoes available in 5 colors.
- First, find a recurrence relation to describe the problem. Explain why the recurrence relation is correct (in the context of the problem).
 - Write out the first 6 terms of the sequence. Solve the recurrence relation. That is, find a closed formula for a_n .

