KING SAUD UNIVERSITY

COLLEGE OF COMPUTER & INFORMATION SCIENCES
DEPT OF COMPUTER SCIENCE

CSC281 Discrete Mathematics
Second Semester 1442 AH (SPRING 2021)
Final Examination: Thursday 29.04.2021 C.E. (time: 1:30 – 4 pm)
Instructor: Prof. Aqil Azmi

Instructions:

- Write your name, id and class serial number (if you remember it).
- Type your final answer in the designated space. Try showing your computation as much as possible.
- This is an open notes, open book final exam.
- Each student works alone. Any cheating party will get Zero.
- I will be available on class's zoom link between 2:30 – 3 pm to answer all questions.
- Print and write using BLUE pen on this answer sheet. Make sure your handwriting is clear and readable.
- Rename this file: *ID-Firstname-Lastname.PDF*
- Upload your solution to Dropbox,

S/N: **Name:** **ID:**

1. [Marks 4 each part carries equal weight]

Answer True or False. No need to state the reason.

	a.	$\forall x \in \mathbb{Z} \quad \exists y \in \mathbb{Z} \quad xy = 1.$
	b.	If $\gcd(a,b) = 1$ then *either* a or b must be a prime.
	c.	Let $f : A \to A$ be a 1-1 corresponding function. If $\lvert A \rvert = n$, then there can be n^n different functions f.
	d.	Set S and $P(S)$ is the powerset of set S. Then, $\left\lvert \, x \mid x \in P(S) \wedge \lvert x \rvert = 2 \, \right\rvert = \binom{\lvert S \rvert}{2}$.

2. [Marks 2]

Compute the sum of the first 120 numbers in the list: 3, 7, 11, 15, 19, 23, … Show all the details.

ANSWER	

2. [Marks 4]

Given the word *ZAMZAM*, if we were to use *all* the letters, compute the following (show all details):

a. How many different words can be made by re-arranging its letters?

ANSWER	

b. Both *Z* together, both *A* together, and both *M* together?

ANSWER	

c. Same as part (a) but one of the *Z* and *A* are together (like this: *ZA*, that is no *AZ*), the other *Z* and *A* could be any place?

ANSWER	

3. [Marks 2]

Consider the following functions defined on real numbers $x \in \mathbb{R}$. Let $f(x) = \lfloor x \rfloor$, and $g(x) = -x$. Define a function $h(x) = (g \circ f \circ g)(x)$. **(a)** Write the function $h(x)$ using the floor function. **(b)** What is the value of $h(-1.4)$?

ANSWER	(a) (b)

5. [Marks 2]

Calculate the value of $2021^{2021} \bmod 21$. Show all the steps.

ANSWER	

4. [Marks 2]

Prove that if n is a positive integer then $n^3 \not\equiv 2 \bmod 9$. Show all your argument.
Hint: use proof by cases.

5. [Marks 2]

How many ways can you distribute 30 students in 3 classrooms where they are equally distributed into classes, *i.e.* 10 students per class.

ANSWER	

6. [Marks 2]

Use mathematical induction to show that for any real number $x > -1$ and $n \in \mathbb{Z}^+$, then $(1+x)^n \geq 1+nx$.