University of Asia Pacific

Department of Computer Science & Engineering

Mid-Semester Examination Spring-2020

Program: B. Sc. Engineering (4th Year/ 1st Semester)

Course Title: Mathematics for Computer Science Course No. CSE 401 Credit: 3.00

Time: 1.00 Hour Full Mark: 60

There are **Four** Questions. **Answer three questions including Q-1 and Q-2.**

1. a. Consider the roulette wheel problem with N slots, numbered 1 to N. Find out the possible number of winners when we play the game for N times. Show the necessary steps. **[15]**

Where, N = (**Last 3 digit of your student Id**) mod 100 + 1728

For example, if your student id is: 17101**123**, then N = (123) mod 100 + 1728
= 23 + 1728
= 1751

b. What is the minimum number of moves required to transfer N disks from one peg to another in a double-tower of hanoi problem. **[5]**

Where, N = (**Last 3 digit of your student Id**) mod 6 + 5

2. a. Suppose, we are working with the Josephus problem in which every q^{th} person is eliminated, instead of every second. Write the appropriate algorithm and use that algorithm to find out the solution for **J(*N*)**. **[15]**

Where, N = (**Last 3 digit of your student Id** +2) mod 10 + 20
and q = (**Last 3 digit of your student Id**) mod 4 + 3

b. Write the recursive equation for finding GCD of two numbers and then using that recursion, find the GCD of N_1 and N_2 **[5]**

Where, N_1 = (**Last 3 digit of your student Id**) mod 100 + 50
and $N_2 = N_1 + 1000$

3. a. Using the perturbation method, find the closed form solution of the following sum: **[8]**

$$\sum_{0 \le k \le n} k^N$$

Where N = (**Last 3 digit of your student Id**) mod 2 + 1

b. Let, we have a recursive equation: **[12]**

$$T_0 = 1$$
$$a_n T_n = b_n T_{n-1} + c_n$$

Where, a_n = (**Last 3 digit of your student Id**) mod 4 + 1
b_n = (**Last 3 digit of your student Id** +1) mod 5 + 1
c_n = (**Last 3 digit of your student Id** +2) mod 6 + 1

Simplify the aforementioned recursive equation by multiplying with a suitable summation factor to find the sum-recurrence form and finally solve the recurrence.

OR

4. a. Let, we have a recursive equation: **[20]**

$$C_0 = N_1$$
$$(n-2)C_n = (n+1)C_{n-1} + N_2 * (n-2) * (n^2 - 1)$$

Where, N_1 = (**Last 3 digit of your student Id**) mod 3 + 1
and N_2 = (**Last 3 digit of your student Id**) mod 4 + 2

Simplify the aforementioned recursive equation by multiplying with a suitable summation factor to find the sum-recurrence form and finally solve the recurrence.