SECI1013: DISCRETE STRUCTURE
SESSION 20242025 – SEMESTER 1
ASSIGNMENT 2

INSTRUCTIONS:

1. This assignment must be conducted in a group (**3 or 4 students**).
   Please clearly write the **group members name and matric number** in the front-page of the submission.
2. Solutions for each question must be readable and neatly written on plain A4 paper. Every step or calculation should be properly shown.
   Failure to do so will result in rejection of the submission of assignment.
   (Due date : 5 December 2024)

QUESTION 1 **[15 MARKS]**

a) Ali lives in Presint 4 and wants to go to School at Presint 6. From his home he has first to reach Presint 5 and then to Presint 6. He may go from Presint 4 to Presint 5 by either 3 car routes or 4 walking routes. From there, he can either choose 4 car routes or 5 walking routes to reach Presint 6. How many ways are there to go from Presint 4 to Presint 6?

(3 marks)

b) If you are given the word "SOFTWARE".

i. Find how many ways you can arrange all the letters. (2mark)

ii. If you only need to arrange 5 strings of letters, how many ways can you arrange it? (2 mark)

iii. If you need to arrange the strings that always start with S and end with E, how many ways can the letter be arranged? (2 marks)

c) Suppose we need to arrange 10 people at a circular table. Find how many ways.

i. If 5 men and 5 women sat around a circular table so that the gender alternate?

(2 marks)

ii. Among the 10 people, 2 are couple and need to be seat next to each other?

(2 marks)

iii. If the people were seated in groups between men and women? (2 marks)

QUESTION 2 **[10 MARKS]**

a) From a group of 8 men and 6 women, five persons are to be selected to form a committee so that at least 3 women are on the committee. In how many ways can it be done?

(5 marks)

b) The SE Students in MJIIT need to form a group for Discrete Structure Assignments. The group must contain four students. Given that the total number of students is 20, half of it is girls. How many different ways can a group be selected if at least one boy must be there in the team? (5 marks)

QUESTION 3 **15 MARKS**

a) Suppose there are five people in a corporate army dinner, including the captain and two vice-captain that are sitting around a circular table

i. How many ways for these people to be seated around the table. (1 mark)

ii. If the captain and both vice-captains should be seated next to each other. (1 mark)

b) In a camping site, five people are staying in one camp with five allocated beds. The head of each camp must not sit next to their assistant to ensure safety of the camp in case of emergency. In that case, how many ways can you allocate the beds to all people in each camp? (4 marks)

c) Suppose there are 10 types of chocolate that are available in a chocolate store. How many ways for you to buy half a dozen chocolate:

i. If there are no restrictions. (1 mark)

ii. If there at least 4 hazelnut flavoured chocolate. (1 mark)

iii. If there are no two chocolates of the same type. (1 mark)

d) In a football match, there are thirteen players that show up to play for the next game.

i. How many ways are there to choose 11 players to take start the game? (1 mark)

ii. How many ways are there to assign 11 positions from the pool of 13 players? (1 mark)

iii. Three players from 13 that showed up are woman. How many ways to choose 11 players to start the game if at least one player must be a woman? (4 marks)

QUESTION 4 **10 MARKS**

a) A box contains three colour balls, which are red, yellow, and green. At least how many balls must be taken from the box to get two balls of the same colour? (1 mark)

b) Ten cheesecakes are shared among thirty students and two teachers. However, each cheesecake can be cut into eight pieces. Show that they can have at least three pieces of cheesecake. (2 marks)

c) From the integers in the set $\{2, 3, 4, 6, 7, 8\}$, what is the smallest number of integers that must be chosen so that at least one pair of them has a sum of 10? (2 marks)

d) What is the minimum number of students required in a discrete mathematics class to be sure that at least six will receive the same grade, if there are five possible grades – A, B, C, D and E. (2 marks)

e) A computer network consists of six computers. Each computer is directly connected to zero or more of the other computers. Show that there are at least two computers that are directly connected to the same number of other computers. (3 marks)