CC1041-DISCRETE STRUCTURES

UNIVERSITY OF MANAGEMENT AND TECHNOLOGY

Assignment # 2

Total Marks: 10

Due Date: 10th January, 2024

Instructor: Iqra Javed

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Mathematical Induction

Question 1: Use mathematical induction to prove summation formulae.

a. $1^2 + 3^2 + 5^2 + \cdots + (2n+1)^2 = \frac{(n+1)(2n+1)(2n+3)}{3}$

Whenever *n* is a nonnegative integer (n≥0).

b. $\frac{1}{1.2} + \frac{1}{2.3} + \ \ldots + \frac{1}{n(n+1)} = \frac{n}{n+1}$ Whenever *n* is a positive integer (n≥1).

$Note: \frac{1}{1.2} = \frac{1}{1X2} = \frac{1}{2}\ and\ same\ for\ \frac{1}{2.3}$

Counting

Question 2:

a. How many license plates can be made using either three digits followed by three uppercase English letters or three uppercase English letters followed by three digits?

b. How many license plates can be made using either two uppercase English letters followed by four digits or two digits followed by four uppercase English letters?

c. How many license plates can be made using either two or three uppercase English letters followed by either two or three digits?

Question 3:

How many strings of eight uppercase English letters are there

a) if letters can be repeated? _____

b) if no letter can be repeated? _____

c) that start with X, if letters can be repeated? _____

d) that start with X, if no letter can be repeated? _____

e) that start and end with X, if letters can be repeated? _____

f) that start with the letters BO (in that order), if letters can be repeated? _____

g) that start and end with the letters BO (in that order), if letters can be repeated? _____

h) that start or end with the letters BO (in that order), if letters can be repeated? _____

Question 4:

How many strings of eight English letters are there

a) that contain no vowels, if letters can be repeated? _____

b) that contain no vowels, if letters cannot be repeated? _____

c) that start with a vowel, if letters can be repeated? _____

d) that start with a vowel, if letters cannot be repeated? _____

e) that contain at least one vowel, if letters can be repeated? _____

f) that contain exactly one vowel, if letters can be repeated? _____

g) that start with X and contain at least one vowel, if letters can be repeated? _____

h) that start and end with X and contain at least one vowel, if letters can be repeated?_____

Question 5:

How many ways are there to seat six people around a circular table where two seatings are considered the same when everyone has the same two neighbors without regard to whether they are right or left neighbors?