NAME	Wasefullah
id No	15391
Degree	B.S (computer science)
Paper	Discrete structure
Date	30 - 9 - 2020

QUESTION - No - 1

SOLUTION:-

let a be the first term and d be the common difference of Arthemetic sequence. Then

$a_n = a + (n-1)d$

$a_3 = a + (3-1)d$ and

$a_8 = a + (8-1)d$

given that $a_3 = 7$ and $a_8 = 17$ therefore

$7 = a + 2d$ ...... (1) and

$17 = a + 7d$ ...... (2)

subtracting (1) and (2) we get

$10 = 5d$

$d = 2$

subtracting $d = 2$ in (1) we have

$7 = a + 2(2)$

which gives $a = 3$

Thus $a_n = a + (n-1)d$

$a_n = 3 + (n-1)2$ (using values of a and d.

Hence the value of 36th term is

$a_{36} = 3 (36-1)2$

$a_{36} = 3 + 70$

$a_{36} = 73$

QUESTION:- 2

Solution: $fog(x) = f(g(x))$

$= f(-x^2+5)$

$= 2(\;) + 3$

$= 2(-x^2+5)+3$

$= -2x^2+10+3$

$= -2x^2+13$

$\Longrightarrow gof(x) = g(f(x))$

$= g(2x+3)$

$= -(2x+3)^2+5$

$= -(4x^2+12x+9)+5$

$= -4x^2-12x-9+5$

$= -4x^2-12x-4$

Ans.

$* \longleftrightarrow * \longleftrightarrow *$

QUESTION - No - 3

ANSWER:

let the given number be $P(n)$

$\Rightarrow P(n): 1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$

For $n = 1$

$P(1): \quad 1 = \frac{1(1+1)(2(1)+1)}{6}$

$1 = \frac{1(2)(3)}{6}$

$1 = \frac{6}{6} \Rightarrow 6/6 = 1$

∴ it is true

let assume that $P(k)$ is true for positive integers k. which

$1^2 + 2^2 + 3^2 + \dots + k^2 = \frac{k(k+1)(2k+1)}{6}$ — (1)

Now we have to prove that $P(k+1)$ is also true

$(1^2 + 2^2 + 3^2 + \dots k^2) + (k+1)^2$

$= \frac{k(k+1)(2k+1)}{6} + (k+1)^2$ (using eq 1)

$= \frac{k(k+1)(2k+1) + 6(k+1)^2}{6}$

$$= \frac{(k+1)(2k^2 + 7k + 6)}{6}$$

$$= \frac{(k+1)(k+1+1)(2(k+1)+1)}{6}$$

Thus $P(k+1)$ is true, whenever $P(k)$ is true.

Hence from the principale of mathematical induction, the statement $P(n)$ is true for all natural numbers n.

<——>*<——>A<——>

QUESTION:- 4

ANSWER:- TYPES OF Relations.

1:- Reflexive Relation:-

A relation R on set A is said to be a reflexive if $(a,a) \in R$ for every $a \in A$.

Example:-

if $A = \{1,2,3,4\}$ then $R = \{(1,1)$ $(2,2)$, $(1,3)$, $(2,4)$, $(3,3)$ $(4,4)\}$ is a reflexive relation?

Sol:-

The relation is reflexive as for every $a \in A$. $(a,a) \in R$, i.e $(1,1)$ $(2,2)$ $(3,3)$, $(4,4)$ etc.

2:- Irreflexive Relation:- A relation R on set A is said to be irreflexive if $(a,a) \notin R$ for every $a \in A$.

Example: let $A = \{1, 2, 3\}$ and $R = \{(1,2), (2,2), (3,1), (1,3)\}$ is a the relation R reflexive or irreflexive?

Sol:-

The relation R is not reflexive as for every $a \in A$, $(a,a) \notin R$, i.e. $(1,1)$ and $(3,3) \notin R$. The relation R is not irreflexive as $(a,a) \notin R$ for some $a \in A$ i.e $(2,2) \in R$.

3:- Symmetric Relation:-

A relation R on set A is said to be symmetric if $(a,b) \in R \iff (b,a) \in R$.

Example:- let $A = \{1, 2, 3\}$ and $R = \{(1,1), (2,2), (1,2), (2,1), (2,3), (3,2)\}$ is a relation R symmetric?

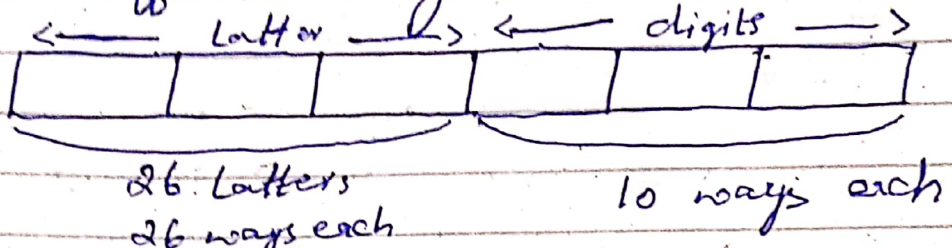
Sol:- The relation is symmetric as for every $(a,b) \in R$, we have $(b,a) \in R$, we have i.e $(1,2), (2,1), (2,3) (3,2) \in R$. but not reflexive because $(3,3) \notin R$.

——————*———*

QUESTION - No - 5

PART 'A':-

Sol:- Each of the three latters can be written in 26 different ways and each of the three digits can be written in 10 different ways.

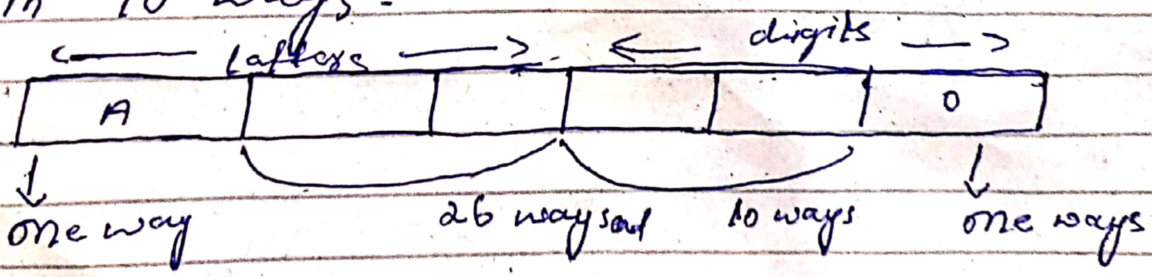


• Hence by the product rule, there is a total of $26 \times 26 \times 10 \times 10 = 17{,}576{,}000$ different license plates possible.

* ⟵⟶ *

PART 'B'

Sol:- The first and last place can be filled in one way only while each of seconds and third place can be filled in 26 ways and each of fourth and fifth place can be filled in 10 ways.



Number of licences plates that begain with A and 0 are $1 \times 26 \times 26 \times 26 \times 1$
$= 67600$

* ⟵⟶ *

PART 'C' :-

Sol:- Number of License plates that begin with PQR are
$1 \times 1 \times 1 \times 10 \times 10 \times 10 = 1000$

<-----> * <-----> * <----->