CT-1

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Sub- discrete Structure

Course - B.Sc. Cs. (Hons) 2nd Sem

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Ans No.1

given statement: $1.1! + 2.2! + 3.3! \ldots n.n! = (n+1)! - 1$

let check for value $n=1$

$= (1+1)! - 1$

$= 2 - 1$

$= 1$

now lets check for value $n=2$

$= (2+1)! - 1$

$= 6 - 1$

$= 5$

so this is true for $n=1,2$ now let assume that it is true for $n=k$ and $n=k+1$ so $n=k+1$

$= (k+1+1)! - 1$

$= (k+2)! - 1$

and $n = k$

$= (k+1)! - 1$

now, $1.1! + 2.2! + \ldots k.k! +$ (adding both side $(k+1)(k-1)!$

$\Rightarrow (k+1)! + (k+1)(k+1)! - 1$

$= (k+1)!(k+1+1) - 1$

$= (k+1)!(k+2) - 1$

$= (k+2)! - 1$ which is true for $k+1$ therefore the statement is true for all positive integers.

Ans No - 2

(i) one particular player is alway included.

we have total no. of member is 15 and we need a team of 11 players.

so. 1 player is alway included. we need to get combination of $^{14}C_{10}$

$$^{14}C_{10} = \frac{14!}{10!\,4!} = \frac{14 \times 13 \times 12 \times 11 \times 10!}{4 \times 3 \times 2 \times 1}$$

$$= 1001$$

there are 1001 ways to select.

(ii) if two such players always been include than both two player will act as one when getting combination.

$$^{13}C_9 = \frac{13!}{9!\,4!}$$

$$= \frac{13 \times 12 \times 11 \times 10}{4 \times 3 \times 2}$$

$$= 13 \times 11 \times 5$$

$$= 715$$

there are 715 ways to select.

Ans NO - 3

given relation

$$R = \{ (a,b) \in R \mid a - b \leq 3 \}$$

① so for reflexive it should have $(a,a) \in R$

if, $a = b$

$$a - a \leq 3$$

$$0 \leq 3$$

which is true therefore R is reflexive.

② now for symmetric $(b,a) \in R$ and $(a,b) \in R$.

so for (b,a).

$$-(a-b) \geq -3$$

$$b - a \geq -3$$

which is true since a will alway be greater than b.

③ now to check transitive we have to create new relat.

such that $a, b, c \in R$

$$(a,b) \in R, \ (b,c) \in R, \ (a,c) \in R$$

$$a - b \leq 3 \ , \quad b - c \leq 3.$$

on adding this

$$a - b + b - c \leq 3 + 3$$

$$a - c \leq 6$$

which is true because a is not getting higher then 3

4) it cant be antisymetric due $a \neq b \in R$

Ans No - 4

the length of string is 6

, so total no. of combinations with 1 is 6! = 720

now if only 1, 1, 1 are in front then we have to calculate how many combination are there with having same 1.

$$\Rightarrow \frac{6!}{4!} = \frac{6 \times 5 \times 4!}{4!} = 30$$

and we have to treat them as one bit string (1,1,1,1)

total combination will become 3! = 6

therefore total no. of combination excluding substring is = 720 - 30 + 6

= 696

∴ there are 696 ways.