ASSIGNMENT 2

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Download all python codes from

https://github.com/harithar1234/ai1103/blob/main/ASSIGNMENT2/assignment2.py

1 PROBLEM(GATE EC, Q. 10)

Let X and Y denote the sets containing 2 and 20 distinct objects respectively and F denote the set of all possible functions defined from X and Y. Let f be randomly chosen from F. The probability of f being one-to-one.....

2 SOLUTION

Number of elements of set X = n(X)=2
Number of elements of set Y = n(Y)=20
Total number of possible functions defined X to Y=n(F)=Number of elements of set F.
The total number of mappings from a set with m elements to a set with n elements, is n^m.

$$n(F) = n(y)^{n(x)} = 20^2 = 400$$

Let O be the set of all possible one-to-one functions defined from set X to Y.
Let n(O) be number of one-to-one functions from X to Y. Clearly n(X)<n(Y).

The total number of one-to-one mappings from a set with m elements to a set with n elements,m<n, is $\frac{n!}{n-m!}$.

$$n(O) = \frac{n(Y)!}{(n(Y)-n(X))!} = \frac{20!}{(20-2)!} = 20 \times 19 = 380$$

Hence,by definition the probability of randomly chosen function f from F being one to one is $\Pr(f)$ given by,

$$\Pr(f) = \frac{n(O)}{n(F)} = \frac{380}{400} = \frac{19}{20} = 0.95$$