5.PERMUTATIONS & COMBINATIONS

(2 x 2) + (2 x 4) = 12 Marks

IMP FORMULAS, KEY CONCEPTS

1) **Fundamental Principle of counting:** If an operation A can be performed in m ways and another operation B, which is independent of A can be performed in n ways, then both the operations A and B can be performed in m·n ways

2) **Fundamental principle of Addition:** If a work A can be done in m ways, another work B which is independent of A, can be done in n ways, then the number of ways that, atleast one of A,B (i.e., A or B) can be done is (m+n).

3) The number of permutations of n dissimilar things taken r at a time is

$^nP_r = \frac{n!}{(n-r)!} = n(n-1)(n-2).....(n-r+1)$ = product of r consecutive integers starting from n = number of one one function that can be defined from A to B, where O(A)=n, O(B)=r

4.1) The number of permutations of 'n' dissimilar things taken r at a time, when repetition of things is allowed any number of times is n^r.

4.2) The number of permutations of n dissimilar things taken r at a time with **at least** one repetition is $n^r - {}^np_r$.

4.3) The number of functions that can defined from a set containing m elements into a set containing n elements is n^m.

5) The number of linear permutations of 'n' things, in which there are p alike things of one kind, q alike things of the 2^{nd} kind, r alike things of the 3^{rd} kind and the rest are different is $\frac{n!}{p!q!r!}$

6) The number of circular permutations of 'n' dissimilar things taken all at a time is $(n-1)!$.

7) The number of circular permutations of n things, when orientation of things is not considered, is $\frac{(n-1)!}{2}$ (half of the actual number of circular permutations).

8) The number of combinations of 'n' dissimilar things taken 'r' at a time is $^nC_r = \frac{n!}{(n-r)!r!} = \frac{^nP_r}{r!}$

9.1) $^nC_r = {}^nC_{n-r}$

9.2) $^nC_r + {}^nC_{r-1} = {}^{(n+1)}C_r$

9.3) If $^nC_r = {}^nC_s$ then r = s or r+s = n

10) The number of diagonals in a regular polygon of n sides is $\frac{n(n-3)}{2}$

11) The number of selections of (p+q) things taken (i) any number (0 to p+q) at a time when p things are alike of one kind and q things are alike of other kind= (p+1)(q+1) (ii) one or more at a time (i.e.,atleast one at a time)=(p+1)(q+1)–1.

12) If m.n are distinct positive integers, then the number of ways of dividing 'm+n' things into two groups containing 'm' things and 'n' things respectively is $\frac{(m+n)!}{m!n!}$