2. MATHEMATICAL INDUCTION

1 x 7 = 7 Marks

IMP FORMULAS, KEY CONCEPTS

1. Steps to prove a given result using the principle of finite Mathematical Induction:

To prove a given statement S(n), $\forall$ n$\in$N proceed as follows:

Step 1: Show that S(1) is true (i.e., LHS of S(1)=RHS of S(1)) [**Basis of induction**]

Step 2: Assume that S(k) is true, for k$\in$N [**Inductive hypothesis**]

Step 3: Hence deduce that S(k+1) is true [**Inductive step**]

Then, by the principle of finite Mathematical Induction S(n) is true $\forall$ n$\in$N.

2. Useful Formulae:

(i) The n^{th} term of the A.P: a, a+d, a+2d......... is $t_n=a+(n-1)d$

(ii) The sum of n terms of the A.P: a,a+d,a+2d...is $S_n=\frac{n}{2}(2a+(n-1)d)=\frac{n}{2}(a+l)$, ($l$ is the last term)

(iii) The nth term of the G.P: a, ar, ar^2, ... is $t_n=ar^{n-1}$.

(iv) $1+2+.......+n=\frac{n(n+1)}{2}$

(v) $1^2+2^2+3^2+....+n^2=\frac{n(n+1)(2n+1)}{6}$

(vi) $1^3+2^3+3^3+......+n^3=\frac{n^2(n+1)^2}{4}$

(vii) Sum of first n odd natural numbers: $1+3+5+.....+(2n-1)=n^2$.

(viii) Sum of first n even natural numbers: 2+4+6+.....+(2n)=n(n+1).