**ASSIGNMENT NO.-4(MATHEMATICAL INDUCTION)**

**(MATHEMATICS)**

Prove by the principle of mathematical induction that for all $n\in N$ :

1. $41^{n}-14^{n}$ is a multiple of 27.

2. $7^{n}-3^{n}$ is divisible by 4.

3. $2^{3n}-1$ is divisible by 7.

4. $4^{n}+15n-1$ is divisible by 9.

5. $\frac{1}{1.2.3}+\frac{1}{2.3.4}+\frac{1}{3.4.5}+ ………………+\frac{1}{n\left(n+1\right)\left(n+2\right)}=\frac{n\left(n+3\right)}{4\left(n+1\right)\left(4+2\right)} $

6. $10^{n}+3 . 4^{n+2}+5$ is divisible by 9.

7. $\sin(θ+\sin(2θ+\sin(3θ+ …………….+\sin(nθ=\frac{\sin(\left(\frac{n+1}{2}\right))θ\sin(\frac{nθ}{2})}{\sin(\frac{θ}{2} )}))))$

8. $\cos(α\cos(2α\cos(4α………….\cos(\left(2^{n-1}α\right)=\frac{\sin(2^{n}α)}{2^{n}\sin(α)}))))$

9. $(1+x)^{n}\geq 1+nx $whenever $x$ is positive and $n$ is a positive integer.

10. when $3^{2n}$ divided by 8,the remainder is always 1.