CLASS –XI

SUBJECT – MATHEMATICS

ASSIGNMENT- 5

TOPIC–MATHEMATICAL INDUCTION

Q1. Using principle of mathematical induction prove that $4^n + 15n - 1$ is divisible by 9 for all natural numbers n.

Q2. Prove by induction that $4 + 8 + 12 + \_\_\_\_\_\_\_\_ + 4n = 2n(n + 1)$ for all natural numbers.

Q3. Prove by the principle of mathematical induction that for all $n \in N$, $n^2 + n$ is even natural number.

Q4. Prove by induction that the sum of the cubes of three consecutive natural numbers is divisible by 9.

Q5. Use Principle of Mathematical induction to prove :-
$1.3.5 + 3.5.7 + \_\_\_\_\_\_ (2n - 1)(2n + 1)(2n + 3) = n(n + 2)(2n^2 + 4n - 1)$

Q6. Prove that $5^n - 5$ is divisible by 4 for all $n \in N$. Hence prove that $(2 . 7^n + 3 . 5^n - 5)$ is divisible by 24 for all $n \in N$.

Q7. If P(n) is the statement $n^2 - n + 41$ is prime, prove that P(1), P(2) and P(3) are true. Prove also that P(41) is not true.

Q8. Prove by mathematical induction that the inequality $2n > 2n + 1$ is true for all natural nos. $n > 2$.

Q9. Prove by mathematical induction that $n(n+1)(2n+1)$ is a multiple of 6 for all $n \in N$.

Q10. Use mathematical induction to prove that
$1.1! + 2.2! + 3.3! \_\_\_\_\_\_\_\_\_\_ + n.n! = (n + 1)! - 1$ for all $n \in N$.

Q11. By the principle of Mathematical Induction, prove the following ;-

(i) $1 + \frac{1}{2} + \frac{1}{2^2} + \_\_\_\_\_\_\_\_\_\_ + \frac{1}{2^{n-1}} = 2 - \frac{1}{2^{n-1}}$

(ii) $1.3 + 2.4 + 3.5 \_\_\_\_\_\_\_\_\_\_ + n(n + 2) = \frac{n(n + 1)(2n + 7)}{6}$

(iii) $2 + 5 + 8 + 11 + \_\_\_\_\_\_\_\_\_\_ + (3n - 1) = \frac{n(3n + 1)}{2}$

(iv) $1^2 + 3^2 + 5^2 + \_\_\_\_\_\_\_\_\_\_ (2n - 1)^2 = \frac{(4n^2 - 1)n}{3}$

(v) $a + (a + d) + (a + 2d) --- + (a + (n - 1)d) = \frac{n[2a + (n - 1)d]}{2}$