Assignment (UNIT-I)

Ques. 1. Write $f(x) = \frac{1}{x}$ in terms of Stirling numbers of the first kind (signed).

Ques. 2. Write the following polynomials in terms of falling and rising factorials.

(a) $f(x) = 2x^3 - 9x^2 + 5x$,

(b) $f(x) = 6x^4 - 5x^3 + 2x^2 - 7x + 4$.

Ques. 3. Find the values of the following.

(a) $\displaystyle\sum_{k=0}^{\infty} \frac{1}{2^k} \sum_{j=k}^{\infty} \frac{4^j}{j!} s(j,k)$,

(b) $\displaystyle\sum_{k=0}^{4} \frac{1}{3^k} \begin{bmatrix} 6 \\ k \end{bmatrix}$.

Ques. 4. Write the following functions in terms of Stirling numbers of the second kind.

(a) $f(x) = e^{2x}$,

(b) $\Delta^k x^n \big|_{x=0}$, where Δ denotes the finite difference.

Ques. 5. Prove the following formula:

$$\begin{Bmatrix} n \\ k \end{Bmatrix} = \frac{1}{k!} \sum_{j=0}^{k} (-1)^{k-j} \binom{k}{j} j^n.$$

Ques. 6. If $W(W(x)) = 1$, then find the value of x.

Ques. 7. Solve the equation $a^x + bx + c = 0$ using Lambert W function, where $b \neq 0$, $a > 0$ and $a \neq 1$.

Ques. 8. Solve the equation $x^{x^3} = 2$.

Ques. 9. Solve the equation $x^{x^{x+1}} = 2$.

Ques. 10. Solve the equation $W\left(e^{e^2 + 1 + x^x}\right) = x^x$.