Discrete Assignment
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PROBLEM STATEMENT (11.9.1 8th question): Find the 7th term of the sequence where the nth term of the sequence is given by $a_n = \frac{n^2}{2^n}$.

ANSWER:

Consider the sequence a_n defined as:

$$a_n = \frac{n^2}{2^n} \tag{1}$$

Let $x(n)$ be the sequence, i.e., $a_n = x(n)$.

Now, let's find the seventh term ($x(7)$):

$$x(7) = \frac{7^2}{2^7} \tag{2}$$

$$x(7) = \frac{49}{128} \tag{3}$$

Therefore, the seventh term ($x(7)$) is $\frac{49}{128}$.

Table 1: Parameters Table

Parameter	**Value**
$x(n)$	$\frac{n^2}{2^n}$
$x(7)$	$\frac{49}{128}$

The Z-transform of the sequence $x(n) = \frac{n^2}{2^n}$ is given by:

$$X(z) = \sum_{n=0}^{\infty} x(n) z^{-n} \tag{4}$$

$$X(z) = \sum_{n=0}^{\infty} \frac{n^2}{2^n} z^{-n} \tag{5}$$

To find $X(z)$ for the seventh term ($x(n)$), substitute $n = 7$:

$$X(z) = \frac{7^2}{2^7} z^{-7} \tag{6}$$

$$X(z) = \frac{49}{128} z^{-7} \tag{7}$$

The Region of Convergence (ROC) for a Z-transform expression is the set of values for which the series converges. For the Z-transform $X(z) = \frac{49}{128} z^{-7}$, the ROC is the set of complex values z for which the series converges.

In this case, the Z-transform term z^{-7} indicates that the ROC includes all values of z except possibly 0, as $z = 0$ would result in division by zero.

So, the ROC for $X(z) = \frac{49}{128} z^{-7}$ is the entire complex plane excluding 0.