Section - 2 Answer - 2

* **Information ⇒**

1. The amount of information conveyed by a message increases as the amount of uncertainity regarding the message becomes greater.

↳ The more it is known about the message a source will produce, the less the uncertainity, and less the information conveyed.

↳ The entropy of Communication theory is a measure of this uncertainity conveyed by a message from a source.

↳ The starting point of information theory is the concept of uncertainity.

Q.⇒ Find the first order entropy $A = \{a_1, a_2, a_3, a_4\}$ where $P(a_1) = P(a_2) = P(a_3) = P(a_4) = 1/4$

Sol⇒

First order entropy

$$H = -\sum_{i=1}^{m} P_i \log_2 P_i \text{ bits/character}$$

Then

$$H = -\left[\frac{1}{4}\log_2\frac{1}{4} + \frac{1}{4}\log_2\frac{1}{4} + \frac{1}{4}\log_2\frac{1}{4} + \frac{1}{4}\log_2\frac{1}{4}\right]$$

$$H = \frac{1}{4}\log_2 4 + \frac{1}{4}\log_2 4 + \frac{1}{4}\log_2 4 + \frac{1}{4}\log_2 4$$

$$= 4\left(\frac{1}{4}\log_2 4\right)$$

$$H = \log_2 4$$

$$\boxed{H = 2 \text{ bits}}$$

Ans