Q=4)

(a) In a binary tree, each of the Yes/No or 0/1 i.e two options are equally likely. Hence the probability of occurrence of each option is 1/2.

Entropy is calculated in bits as

$$H = \sum_{i=1}^{m} P_i \log_2(1/P_i)$$

where m is total no. of ~~records~~ options (outcome) & P_i is the fraction of records corresponding to each option/outcome

In case of a binary tree, m=2.

using mathematical formula

$$\lim_{x \to 0} x \cdot \log x = 0$$

the minimum value of entropy = H = 0.

When each symbol/outcome is equally likely the i.e ~~each outcon~~ all outcomes form a uniform distribution. The maximum entropy distribution is $H = \log_2 m$; where m is total no. of outcomes

In binary tree m=2 ∴ maximum entropy = $\log_2 2 = 1$

(b) from the argument above, minimum value of entropy when all outcomes are equally likely = 0 ($\lim_{x \to 0} x \log x = 0$) & maximum value is $\log_2 m$ where m is the no. of possible outcomes. In our case m=8 ; Hence max. entropy is $\log_2 8$.