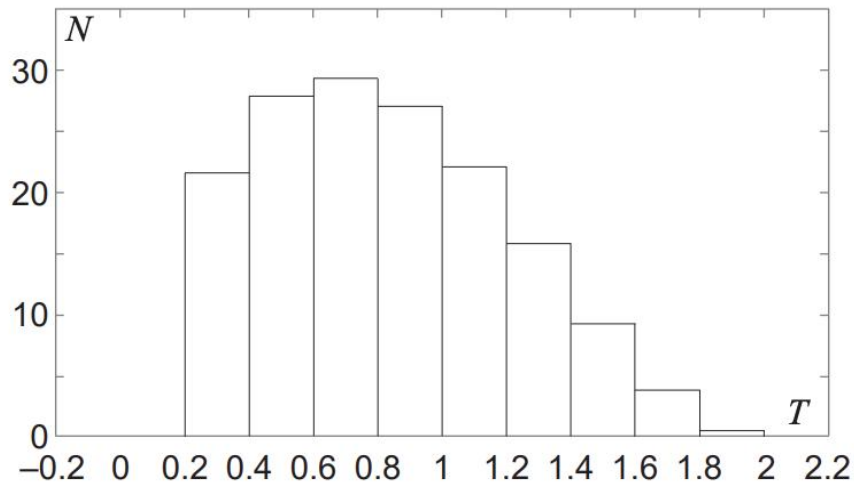


Question 16**(7 marks)**

A large refrigerator in a scientific laboratory is always required to maintain a temperature between 0°C and 1°C to preserve the integrity of biological samples stored inside. A scientist working in the laboratory suspects that the refrigerator is not maintaining the required temperature and decides to record the temperature every hour for seven days. Based on these measurements, the scientist concludes that the temperature, T , in the refrigerator is normally distributed with a mean of 0.8°C and a standard deviation of 0.4°C .

- (a) Temperature in degrees Fahrenheit, T_f , is given by $T_f = \frac{9}{5} T + 32$. Determine the mean and standard deviation of the refrigerator temperature in degrees Fahrenheit. (2 marks)
- (b) Determine the probability that the refrigerator temperature is above 1°C . Give your answer rounded to four decimal places. (1 mark)

The histogram of data gathered by the scientist is shown below. N denotes the number of observations in each temperature interval.



- (c) Do you agree that the normal distribution was an appropriate model to use? Provide a reason to justify your response. (2 marks)

An alternative probability density function proposed to model the refrigerator temperature, in degrees Celcius, is given by:

$$p(t) = \frac{3}{4} t^3 - 3t^2 + 3t, \quad 0 \leq t \leq 2$$

- (d) Determine the probability that the refrigerator temperature is above 1 °C using the new model. (2 marks)