17.1 Question:-

A test is conducted which is consisting of 20 MCQs (Multiple Question) with every mcq having four option out of which only one is correct. Determine the probability that a person undertaking that test has answered exactly 5 question wrong.

Solution:- This is a problem of binomial distribution

For each Multiple Choice Question:-

$$\text{Probability of wrong answer} = p = \frac{\text{No. of wrong chain}}{\text{Total No. of Choices}}$$

$$= \frac{3}{4} = 0.75$$

$$\text{Probability of right answer} = q = \frac{\text{No. of Right choice}}{\text{Total No. of Chain}}$$

$$= \frac{1}{4} = 0.25$$

Probability that a person undertaking that test has answered exactly 5 question wrong. Using formula for binomial distribution

$$P = {}^{n}C_{r} (p)^{r} (q)^{n-r}$$

Here $n = 20$, $r = 5$, $p = 0.75$, $q = 0.25$

Hence Probability of exactly 5 question wrong

$$= {}^{20}C_{5} (0.75)^{5} (0.25)^{20-5}$$

$$= \frac{\lfloor 20}{\lfloor 15 \, \lfloor 20-5} \times (0.75)^{5} (0.25)^{15} = 3.42649 \times 10^{-6}$$

$$= 0.00000342649$$