Assignment-3

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Download all latex codes from:

https://github.com/PrasannaLanka/Assignment3/blob/main/Assignment3/codes/Assignment3.tex

and python codes from

https://github.com/PrasannaLanka/Assignment3/blob/main/Assignment3/codes/Assignment3.py

PROBLEM: GATE 2002(CS)-Q.41

Four fair coins are tossed simultaneously. The probability that at least one head and one tail turn up is

a) $\frac{1}{16}$

b) $\frac{1}{8}$

c) $\frac{7}{8}$

d) $\frac{15}{16}$

SOLUTION

Let discrete random variable x is following bernoulli distribution with parameters n, p where $n = 4, p =$ P(head) $= \frac{1}{2}$ and $q =$ P(tail) $= \frac{1}{2}$
PMF of x successes in n trials is given by

$$\Pr(X = x) = {}^{n}C_{x} p^{x} q^{n-x} \tag{0.0.1}$$

Cases for atleast one head or one tail:

1) 1 Head 3 tails
2) 2 Heads 2 tails
3) 3 Heads 1 tail

$$\sum_{j=1}^{3} \Pr(X = j) = {}^{4}C_{1}(1/2)^{1}(1/2)^{3} + {}^{4}C_{2}(1/2)^{2}(1/2)^{2} \tag{0.0.2}$$

$$+ {}^{4}C_{3}(1/2)^{3}(1/2)^{4} \tag{0.0.3}$$

$$\sum_{j=1}^{3} \Pr(X = j) = \frac{7}{8} \tag{0.0.4}$$

The required probability is $\boxed{\frac{7}{8}}$

$\therefore$ **Option C is true**