AI1110 ASSIGNMENT-7

DASARI SRINITH (CS21BTECH11015)

***Abstract*—This document contains the solution for Assignment 7 (NCERT GRADE 11 CHAPTER 16 Exercise 16.2 Question 5)**

QUESTION 5 :

Three coins are tossed. Describe

(i) Two events which are mutually exclusive.
(ii) Three events which are mutually exclusive and exhaustive.
(iii) Two events , which are not mutually exclusive.
(iv) Two events which are mutually exclusive but not exhaustive.
(v) Three events which are mutually exclusive but not exhaustive.

SOLUTION :

Since a coin can either turn up Head(H) or Tail(T) , the possible outcomes when 3 coins are tossed are (or) the sample space contains ,

$$\text{S} = \{\text{TTT , TTH , THT , HTT THH , HTH , HHT , HHH}\} \quad (1)$$

Let X be a random variable and which maps to the following set of real numbers,

$$X \in \{1, 2, 3, 4, 5, 6, 7, 8\}$$

, as defined below in Table I.

Event	Description of event
$X = 1$	TTT
$X = 2$	TTH
$X = 3$	THT
$X = 4$	HTT
$X = 5$	THH
$X = 6$	HTH
$X = 7$	HHT
$X = 8$	HHH

TABLE I

(i) **Two events which are mutually exclusive**
Let us take the events A,B as shown in Table II. So ,

Event	Description of event
A	Getting all 3 Heads
B	Getting all 3 Tails

TABLE II

$$A = \{(X = 8)\} \quad (2)$$
$$B = \{(X = 1)\} \quad (3)$$

and Since ,

$$A \cap B = \phi \quad (4)$$

So ,events A and B are mutually exclusive.

(ii) **Three events which are mutually exclusive and exhaustive**
Let us take events C,D,E as shown in Table III. So ,

Event	Description of event
C	Getting all 3 Tails
D	Getting exactly 2 Tails
E	Getting at least 2 Heads

TABLE III

$$C = \{X = 1\} \quad (5)$$
$$D = \{(X = 2) \cup (X = 3) \cup (X = 4)\} \quad (6)$$

$$E = \{(X = 5) \cup (X = 6)\} \cup \{(X = 7) \cup (X = 8)\} \quad (7)$$

and Since ,

$$C \cap D = \phi \quad (8)$$
$$D \cap E = \phi \quad (9)$$
$$C \cap E = \phi \quad (10)$$

We can say that , events C,D,E are mutually exclusive. And ,

$$C \cup D \cup E = S \quad (11)$$

So, events C,D,E are mutually exclusive and exhaustive.

(iii) **Two events ,which are not mutually exclusive**

Let us take the events F,G as shown in Table IV. So ,

Event	Description of event
F	Getting all 3 Heads
G	Getting at least 2 Heads

TABLE IV

$$F = \{(X = 8)\} \tag{12}$$

$$G = \{(X = 5) \cup (X = 6)\} \cup \{(X = 7) \cup (X = 8)\} \tag{13}$$

and Since ,

$$F \cap G \neq \phi \tag{14}$$

So ,events F and G are not mutually exclusive.

(iv) **Two events ,which are mutually exclusive but not exhaustive**

Let us take the events H,I as shown in Table V. So ,

Event	Description of event
H	Getting all 3 Heads
I	Getting all 3 Tails

TABLE V

$$H = \{(X = 8)\} \tag{15}$$

$$I = \{(X = 1)\} \tag{16}$$

and Since ,

$$H \cap I = \phi \tag{17}$$

So ,events H and I are mutually exclusive. And ,

$$H \cup I \neq S \tag{18}$$

So , events H and I are mutually exclusive but not exhaustive.

(v) **Three events which are mutually exclusive but not exhaustive**

Let us take events J,K,L as shown in Table VI. So ,

Event	Description of event
J	Getting all 3 Tails
K	Getting exactly 2 Tails
L	Getting exactly 1 Tail

TABLE VI

$$J = \{(X = 1)\} \tag{19}$$

$$K = \{(X = 2) \cup (X = 3) \cup (X = 4)\} \tag{20}$$

$$L = \{(X = 5) \cup (X = 6) \cup (X = 7)\} \tag{21}$$

and Since ,

$$J \cap K = \phi \tag{22}$$

$$K \cap L = \phi \tag{23}$$

$$J \cap L = \phi \tag{24}$$

We can say that , events J,K,L are mutually exclusive. And ,

$$J \cup K \cup L \neq S \tag{25}$$

So, events J,K,L are mutually exclusive but not exhaustive.