PNS (HW1)

1. a) $A_1 = \{vdd, vvd, vdv, vvv\}$, c) $B_1 = \{ddd, dvd, ddv, dvv\}$
b) $A_2 = \{dvd, dvv, ddv, dvv\}$, d) $B_2 = \{ddd, ddv, vdd, vdv\}$
e) $A_3 = \{ddd, vvv\}$, f) $B_3 = \{vdv, dvd\}$
g) $A_4 = \{vdd, vdv, vvd, dvd, dvv, vvv, ddv\}$ h) $B_4 = \{ddv, dvd, vdd, ddd\}$

(e) $A_1 \cap B_1 = \phi$ & $A_1 \cup B_1 = S$ → Both mutually exc. & collec. exhaustive.

(f) $A_2 \cap B_2 = \phi$ & $A_2 \cup B_2 = S$ → " " " " "

(g) $A_3 \cap B_3 = \phi$ but $A_3 \cup B_3 \neq S$ → Only mutually exc.

(h) $A_4 \cap B_4 \neq \phi$ but $A_4 \cup B_4 = S$ → Only collec. exhaustive.

2. a) $S = \{aaa, aaf, afa, aff, faa, faf, ffa, fff\}$

b) $Z_f = \{aaf, aff, fff, faf\}$, $X_A = \{aff, aaa, afa, aaf\}$

c) No d) No.

e) $C = \{aaf, afa, faa, aaa\}$, $D = \{aff, faf, ffa, fff\}$ (f) Yes (g) Yes

3. $S = \{VB, VL, DB, DL\}$

4. S contains 52 pow elements.

No. of outcomes in the event that 1st card is a heart = 13.

5. No. of outcomes in " " " person born in July = 31. 365 elements in S.

6. a) event space ① UG students attending MTH101 in C102 ③ UG students currently at the gym.
② UG students enrolled in CSE ④ UG students eating at the mess at 1:30 pm.

8. a) No b) Yes c) Yes, Tuscan pizza doesn't have onion toppings in any case d) Yes e) No.

9. P.T.O →

10. $S = \{HF, HW, MF, MW\}$

11. a) $S = \{ht, hf, mt, mf, lt, lf\}$. b) $A_1 = \{mt, mf\}$ c) $A_2 = \{ht, mt, lt\}$
d) $A_3 = \{ht, hf, lt, lf\}$ e) $A_1 \cap A_2 \cap A_3 \neq \phi$ not mutually exc.
f) $A_1 \cup A_2 \cup A_3 = S$ → Collectively exhaustive.

12. $S = \{BF, BW, LF, LW\}$

13. a) $S = \{hhh, hht, hth, htt, thh, tht, tth, ttt\}$ b) 2^8 events (inc ϕ (null set))
c) $i \in [0, 3]$ ∵ There can be 0, 1, 2, 3 heads in a seq. of 3 coins tossed.
d) B_0 = no heads occur ⇒ {TTT} e) B_1 = 1 head occurs ⇒ {TTH, THT, HTT}
f) $B_2 = \{HHT, HTH, THH\}$ g) $B_3 = \{HHH\}$.
h) B_i's are mutually exclusive & collectively exhaustive ∵ $[B_0 \cap B_1 \cap B_2 \cap B_3 = \phi$ & $B_0 \cup B_1 \cup B_2 \cup B_3 = S]$

a) $B_0 = \{TTT\}$, $B_1 = \{HTT, THT, TTH\}$ $B = \{B_0, B_1\} \Rightarrow B = \{TTT, HTT, THT, TTH\}$

$\because \{B_0, B_1\}$ isn't collectively exhaustive $\Rightarrow$

$\Rightarrow B = \{B_0, B_1\}$ is not an event space.

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15. a) $S = \{char\_1, char\_2, \ldots, char\_140\}$ [where char_i is either "C" (correct) or "I" (incorrect) for i = 1, 2, ..140]

$\Rightarrow$ Total possible outcomes in $S = 2^{140}$.

b) $A_k \rightarrow$ atleast k characters received correctly.

$\Rightarrow A_0 \rightarrow$ no characters recd. correctly

$\Rightarrow A_1 \rightarrow$ 1 character recd. correctly

$\Rightarrow A_{140} \rightarrow$ All 140 characters " "

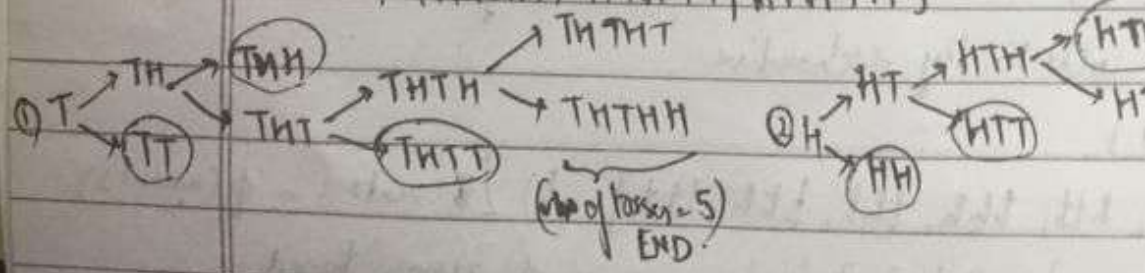
$\Rightarrow A_1$ is a subset of A_2, A_2 is a subset of A_3 & so on upto A_{139} as subset of A_{140}.

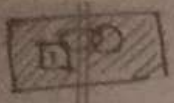
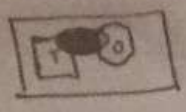
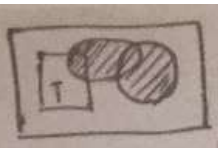
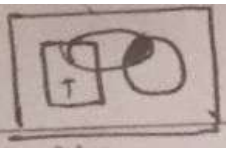
$\Rightarrow$ union of 2 events A_i & A_j must also be an event in the event space.

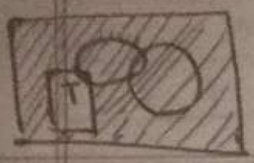
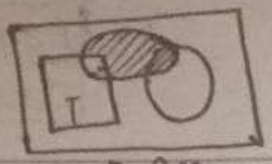
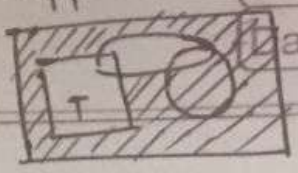
$\Rightarrow \because A_k$'s elements form a set of mutually exclusive & (as well as) collectively exhaustive events $\Rightarrow A_k$ together form an event space.

c) Another set of events forming an event space could be - set of events corresponding to position of 1st correct char. received.

M. $S = \{H, T, HH, TT, TH, HT, THH, THT, HTH, HTT, THTH, THTT, HTHH, HTHT, THTHT, THTHH, HTHTT, HTHTH\}$



1. a) R  b) M-O  c) MUO  d)  M∩O

e) RUM  f)  RAM g) $T^c - M$  $(T^c = R)$

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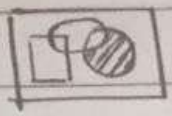
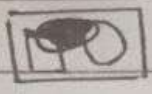
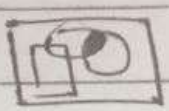
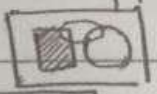
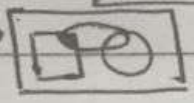
2. Menus: 1) Regular pizza w/ no toppings 

2) Regular pizza w/ onion toppings only → 

3) " " mushroom " only 

4) " " mushroom & onion toppings both. 

5) Tuscan pizza w/ no toppings → 

6) " " " mushroom " → 

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