

## CS 333202: Probability and Statistics

### HW1 Part I

1. (a)  $EF^cG$   
 (b)  $E \cup F \cup G$   
 (c)  $EFG$   
 (d)  $E^cF^cG^c \cup EF^cG^c \cup E^cFG^c \cup E^cF^cG$   
 (e)  $EFG^c \cup EF^cG \cup E^cFG$
2. See the Venn diagram in next page.
- (a)  $1,000 + 19,000 + 0 = 20,000$   
 (b)  $7,000 + 1,000 + 1,000 + 3,000 = 12,000$   
 (c)  $100,000 - (A \cup B \cup C) = 100,000 - 32,000 = 68,000$
3. (a) False; toss a die and let  $A = \{1, 2\}, B = \{2, 3\}, C = \{1, 3\}$ .  
 (b) False; toss a die and let  $A = \{1, 2, 3, 4\}, B = \{1, 2, 3, 4, 5\}, C = \{1, 2, 3, 4, 5, 6\}$ .
4. Clearly,  $P(B_m) \leq \sum_{n=m}^{\infty} P(A_n)$   
 Since,  $\sum_{n=1}^{\infty} P(A_n)$  converges,

$$\lim_{m \rightarrow \infty} P(B_m) \leq \lim_{m \rightarrow \infty} \sum_{n=m}^{\infty} P(A_n) = 0$$

This gives  $\lim_{m \rightarrow \infty} P(B_m) = 0$ .

Therefore,  $B_1 \supseteq B_2 \supseteq \dots \supseteq B_m \supseteq \dots$

Implies that,

$$P\left(\bigcap_{m=1}^{\infty} \bigcup_{n=m}^{\infty} A_n\right) = P\left(\bigcap_{m=1}^{\infty} B_m\right) = \lim_{m \rightarrow \infty} P(B_m) = 0$$

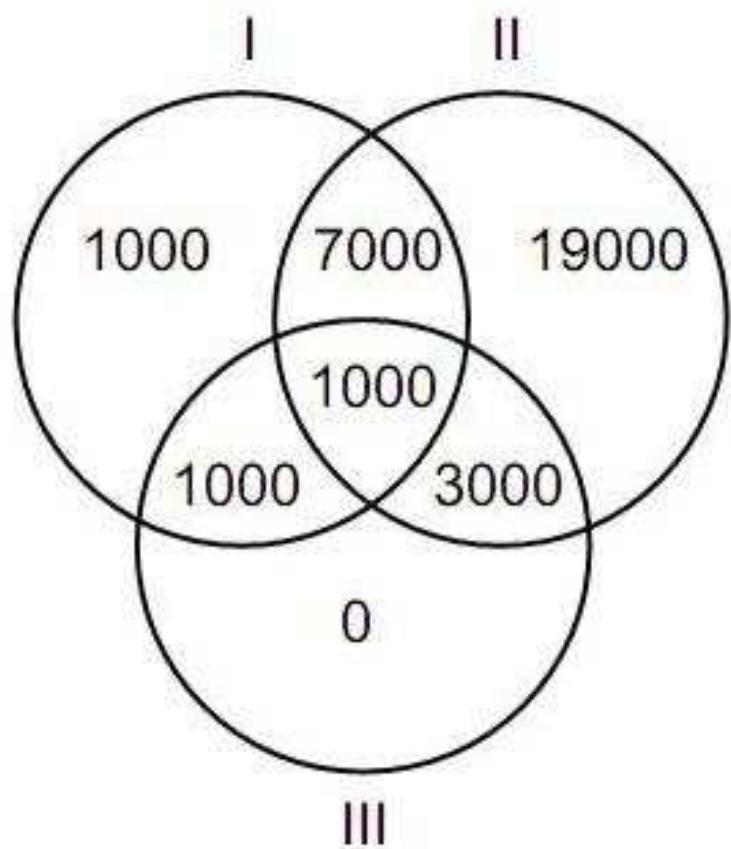


Figure 1: Venn diagram of problem 2

5. The answer is  $P(\{1, 2, \dots, 1999\}) = \sum_{i=1}^{1999} P(\{i\}) = \sum_{i=1}^{1999} 0 = 0$