ASSIGNMENT 3

EE24BTECH11003 - Akshara Sarma Chennubhatla

I. D: MCQs with One or More than One Correct

3) The probability that at least one of the events A and B occurs is 0.6. If A and B occur simultaneously with probability 0.2, then $\Pr\left(\overline{A}\right) + \Pr\left(\overline{B}\right)$ is (1987 − 2*Marks*)
   a) 0.4
   b) 0.8
   c) 1.2
   d) 1.4
   e) none

   (Here $\overline{A}$ and $\overline{B}$ are the complements of A and B, respectively).
4) For two given events A and B, $\Pr(A \cap B)$ (1988 − 2*Marks*)
   a) not less than $\Pr(A) + \Pr(B) - 1$
   b) not greater than $\Pr(A) + \Pr(B)$
   c) equal to $\Pr(A) + \Pr(B) - \Pr(A \cup B)$
   d) equal to $\Pr(A) + \Pr(B) + \Pr(A \cup B)$
5) If E and F are independent events such that $0 < \Pr(E) < 1$ and $0 < \Pr(F) < 1$, then (1989 − 2*Marks*)
   a) E and F are mutually exclusive
   b) E and $F^{\complement}$ (the complement of the event F) are independent
   c) $E^{\complement}$ and $F^{\complement}$ are independent
   d) $\Pr(E|F) + \Pr\left(E^{\complement}|F^{\complement}\right) = 1.$
6) For any two events A and B in a sample space (1991 − 2*Marks*)
   a) $\Pr(A|B) \geq \frac{\Pr(A)+\Pr(B)-1}{\Pr(B)}, \Pr(B) \neq 0$ is always true
   b) $\Pr\left(A \cap \overline{B}\right) = \Pr(A) - \Pr(A \cap B)$ does not hold
   c) $\Pr(A \cup B) = 1 - \Pr\left(\overline{A}\right)\Pr\left(\overline{B}\right)$, if A and B are independent
   d) $\Pr(A \cup B) = 1 - \Pr\left(\overline{A}\right)\Pr\left(\overline{B}\right)$, if A and B are disjoint.
7) E and F are two independent events. The probability that both E and F happen is $\frac{1}{12}$ and the probability that neither E nor F happens is $\frac{1}{2}$. Then, (1993 − 2*Marks*)
   a) $\Pr(E) = \frac{1}{3}, \Pr(F) = \frac{1}{4}$
   b) $\Pr(E) = \frac{1}{2}, \Pr(F) = \frac{1}{6}$
   c) $\Pr(E) = \frac{1}{6}, \Pr(F) = \frac{1}{2}$
   d) $\Pr(E) = \frac{1}{4}, \Pr(F) = \frac{1}{3}$
8) Let $0 < \Pr(A) < 1, 0 < \Pr(B) < 1$ and $\Pr(A \cup B) = \Pr(A) + \Pr(B) - \Pr(A)\Pr(B)$ then (1995*S*)
   a) $\Pr(A|B) = \Pr(B) - \Pr(A)$
   b) $\Pr(A' - B') = \Pr(A') - \Pr(B')$
   c) $\Pr(A \cup B)' = \Pr(A')\Pr(B')$
   d) $\Pr(A|B) = \Pr(A)$
9) If from each of the three boxes containing 3 white and 1 black, 2 white and 2 black, 1 white and 3 black balls, one ball is drawn at random, then the probability that 2 white and 1 black ball will be drawn is (1998 − 2*Marks*)

a) $\frac{13}{32}$ b) $\frac{1}{4}$ c) $\frac{1}{32}$ d) $\frac{3}{16}$

10) If $\overline{E}$ and $\overline{F}$ are the complementary events of events E and F respectively and if $0 < \Pr(F) < 1$, then $(1998 - 2Marks)$
   a) $\Pr(E|F) + \Pr\left(\overline{E}|F\right) = 1$
   b) $\Pr(E|F) + \Pr\left(E|\overline{F}\right) = 1$
   c) $\Pr\left(\overline{E}|F\right) + \Pr\left(E|\overline{F}\right) = 1$
   d) $\Pr\left(E|\overline{F}\right) + \Pr\left(\overline{E}|\overline{F}\right) = 1$
11) There are four machines and it is known that exactly two of them are faulty. They are tested, one by one, in a random order till both the faulty machines are identified. Then the probability that only two tests are needed is $(1998 - 2Marks)$

   a) $\frac{1}{3}$ b) $\frac{1}{6}$ c) $\frac{1}{2}$ d) $\frac{1}{4}$

12) If E and F are events with $\Pr(E) \leq \Pr(F)$ and $\Pr(E \cap F) > 0$, then $(1998 - 2Marks)$
   a) occurrence of E $\Rightarrow$ occurrence of F
   b) occurrence of F $\Rightarrow$ occurrence of E
   c) non-occurrence of E $\Rightarrow$ non-occurrence of F
   d) none of the above implications holds
13) A fair coin is tossed repeatedly. If the tail appears on first four tosses, then the probability of the head appearing on the fifth toss equals $(1998 - 2Marks)$

   a) $\frac{1}{2}$ b) $\frac{1}{32}$ c) $\frac{31}{32}$ d) $\frac{1}{5}$

14) Seven white balls and three black balls are randomly placed in a row. The probability that no two black balls are placed adjacently equals $(1998 - 2Marks)$

   a) $\frac{1}{2}$ b) $\frac{7}{15}$ c) $\frac{2}{15}$ d) $\frac{1}{3}$

15) The probabilities that a student passes in Mathematics, Physics and Chemistry are m, p and c, respectively. Of these subjects, the student has a 75% chance of passing in at least one, a 50% chance of passing in at least two, and a 40% chance of passing in exactly two. Which of the following relations are true? $(1999 - 3Marks)$

   a) $p + m + c = \frac{19}{20}$ b) $p + m + c = \frac{27}{20}$

   c) $pmc = \frac{1}{10}$ d) $pmc = \frac{1}{4}$

16) Let E and F be two independent events. The probability that exactly one of them occurs is $\frac{11}{25}$ and the probability of none of them occurring is $\frac{2}{25}$. If $\Pr(T)$ denotes the probability of occurrence of the event T, then (2011)

   a) $\Pr(E) = \frac{4}{5}, \Pr(F) = \frac{3}{5}$ b) $\Pr(E) = \frac{1}{5}, \Pr(F) = \frac{2}{5}$

   c) $\Pr(E) = \frac{2}{5}, \Pr(F) = \frac{1}{5}$ d) $\Pr(E) = \frac{3}{5}, \Pr(F) = \frac{4}{5}$

17) A ship is fitted with three engines E_1, E_2 and E_3. The engines function independently of each other with respective probabilities $\frac{1}{2}, \frac{1}{4}$ and $\frac{1}{4}$. For the ship to be operational at least two of its engines must function. Let X denote the event that the ship is operational and let X_1, X_2 and X_3 denote respectively the events that the engines E_1, E_2 and E_3 are functioning. Which of the following is(are) true? (2012)

a) $\Pr\left(X_1^{\complement}|X\right) = \frac{3}{16}$
b) $\Pr$ (Exactly two engines of the ship are functioning | X) $= \frac{7}{8}$
c) $\Pr(X|X_2) = \frac{5}{16}$
d) $\Pr(X|X_1) = \frac{7}{16}$