**SECTION E**

**(i)** There are 50 boxes. We want to know the expected number of empty boxes when there are 100 balls.

*Let Em* = expected number of empty boxes for *m* balls and 50 boxes.

On average, *E*99 boxes will be empty after we've placed the first ninety nine balls.

Now, the last ball must be placed in an empty box or a non-empty box. The probability of placing it in an empty box is *E*99/50 because there are *E*99 empty boxes out of the 50.

Thus, *E*9/50 of the time, we'll have *E*99−1 empty boxes; the rest of the time, we'll have *E*99 empty boxes, that is,

*E*10=(*E*99 / 50)(*E*9−1) + (1− *E*99 / 50)*E*99 = 49/50 *E*99.

we conclude that :

***Em* = (49/50)^m \* 50.**

**(ii)**

**(i)** Bit Error Rate = Number of bits in error / Total number of bits transmitted

10^-10 = Number of bits in error / 1000

**Number of bits in error = 10^(-10 + 3)**

**= 10^ -7 bits**

**(ii)** P(10 or more errors in 1000 bits ) = (1000 10)(10-10)10(1-10-10)1000-10

= 10-10(10)(1-10-10)1000-10

Putting (1-10-10)1000-10 as 0.99 , we have

**P(10 errors in 1000 bits) = 0.99\* 10-100**

**(iii)** We know that there are total 16 favourable outcomes for Alina(3 Queens(from other suits) and 13 spades).

Now probability of alina winning one night is = 16/52 = 4/13

While the probability of her losing at the night is = 9/13

Now her probable earning for a night is = 4\*4/13 + (-1)\*9/13

= 7/13

**Similarly her probable earning for a month will be = 7/13 \* 30**

**= $ 16.1538**