**ChE 320\_Spr\_17\_HW 3 Solution**

**Total: 100 pts.**(Please do not cut point more than once for the same mistake, e.g. If there are 3 parts in a question, answer was calculated wrong in the 1st part. But the method was correct for the 2nd and 3rd part; give student the points of 2nd and 3rd part*. If applicable, credits for the answersare also given for using correct units*)

**3-100(20 pts)**

# a) P(X < 0.25) = P(X=0.1) + P(X=0.2)= 0.1 + 0.1 = 0.2*+3 for correct method, +2 for answer*

b) P(0.15 < X ≤ 4.5) = 0.9 *+5 for correct answer*

c) F(x)

*+3for correct method, +2 for answer*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | x < 0.1 | 0.1 ≤ x < 0.2 | 0.2 ≤ x < 0.3 | 0.3 ≤ x < 0.4 | 0.4 ≤ x < 0.5 | 0.5 ≤ x < 0.6 | 0.6 ≤ x |
| F(x) | 0 | 0.1 | 0.2 | 0.5 | 0.7 | 0.9 | 1.0 |

d) E(X) = 0.1(0.1) + 0.2(0.1) + 0.3(0.3) + 0.4(0.2) + 0.5(0.2) + 0.6(0.1) = 0.36*+3 for correct method, +2 for answer*

**3-142(20 pts)**

Let X denote the number of calls in 30 minutes. Because the time between calls is an exponential random variable, X is a Poissonrandom variable with  calls per minute ⇒ 3 calls per 30 minutes.

a) P(X > 3) = *+3 for correct method, +1 for answer*

b) P(X = 0) = *+3 for correct method, +1 for answer*

c) Let Y denote the time between calls in minutes. Then,  and

.

Therefore,  and x = 46.05 minutes.*+3 for correct method, +1 for answer*

d) *+3 for correct method, +1 for answer*

e) The probability of no calls in one-half hour is (from part b) e-3 = 0.04979. Therefore, for four non-overlapping one-half hour intervals, the probability of no calls is (e-3)4 = (0.04979)4 = 6.14 × 10-6.*+3for correct method, +1 for answer*

**3-160(20 pts)**

a) P(X ≤ 5, Y ≤ 8) = P(X ≤ 5)P(Y ≤ 8)

= (0.6321)(0.6321)

= 0.3996 *+3 for correct method, +2 for answer*

b) P(X > 5, Y ≤ 6) = P(X > 5)P(Y ≤ 6)

= (1 − P(X ≤ 5))P(Y ≤ 6)

= (0.3679)(0.5276)

= 0.1941 *+3 for correct method, +2 for answer*

c) P(3 < X ≤ 7, Y > 7) = P(3 < X ≤ 7)P(Y > 7)

= (P(Y ≤ 7) − P(Y ≤ 3))(1 − P(Y ≤ 7))

= (0.3022)(0.4169)

= 0.1260 *+3 for correct method, +2 for answer*

d) P(X > 7, 5 < Y ≤ 7) = P(X > 7)P(5 < Y ≤ 7)

= (1 − P(X ≤ 7))(P(Y ≤ 7) − P(Y ≤ 5))

= (0.2466)(0.1184)

= 0.0292 *+3 for correct method, +2 for answer*

**3-170(20 pts)**

P(operate) = [1-(0.1)(0.05)]2 = 0.990025*+12 for correct method, +8 for answer*

**3-180(20 pts)**

Let D denote the width of the casing minus the width of the door. Then, D is normally distributed.

1. E(D) = 1/8 *+3 for answer*

V(D) = , *+3 for correct method, +2 for answer*

b) *+4 for correct method, +2 for answer*

c) *+4 for correct method, +2 for answer*