Assignment 9

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Question 1

Part (a)

E1 = T1

E2 = E1 + T2

E3 = E1 + T3

E4 = E2 + T4

E5 = E2 + T5

E6 = E3 + T6

E7 = E3 + T7

E8 = E3 + T8

E9 = max (E5, E6, E7) + T9

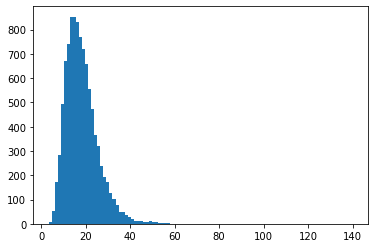
E10 = max (E4, E8, E9) + T10

Part (b)

Firstly, I generated independent exponential Ti with means given in the table. Using these Ti’s, Ei’s are calculated using formula given in part (a). Above procedure is repeated for n = 10000 times and E10 are stored.

Part (c)

Histogram of E10 obtained by above procedure is shown below.



The curve is right-skewed or positively skewed.

Part (d)

Probability of missing a deadline = 0.0001

Standard Deviation = 0.009999499987501888

Only one sample has missed a deadline out of 10,000 samples. Only this sample contributes in calculating this probability. Therefore, simple monte carlo cannot capture the distribution of the probability.

Part (e)

Formula Used-

where wi = p(xi)/q(xi)

T = [T1, T2, T3, ………T10]

p(T) = p1(T1) \*p2(T2) \*p3(T3) ...…… p10(T10)

where pj = probability density of exponential distribution with mean θj (given in the table)

q(T) = q1(T1) \*q2(T2) \*q3(T3) ...…… q10(T10)

where qj = probability density of exponential distribution with mean Λj = 4\*θj.

Generated independent exponential Tj with probability density qj.

Calculated E using formulas of part (a).

f(T) = IE10 > 70

h(T) = f(T)\*p(T)/q(T), where f, p and q are as described above.

imp = , where Xi = T = [T1, T2, …………T10]

Obtained following stats -

Prob of missing deadline = imp = 5.0172865727\*10^(-05)

Standard Deviation = = 0.0030142608908469565

ne = 11.527863597940376

Part (f)

Taken qj = probability density of exponential distribution with mean Λj = k\*θj for j = 1,2,4,10.

= θj otherwise.

All other things are same as part (d).

Obtained following stats -

For k = 3.0

imp = 3.2093682879512505\*10^(-05)

= 0.00017974985759344224

ne = 974.2996399406761

For k = 4.0

imp = 3.125380185317744\*10^(-05)

= 0.0001562587143824664

ne = 355.5271356159728

For k = 5.0

imp = 3.1328659129042744\*10^(-05)

= 0.0001639561292479486

ne = 178.46361425213095

Part (g)

Results are greatly improved in part (f) when compared to part (e). ne in part (e) was very less as compared to best ne obtained in part (f) with k = 3.0. Standard deviation is also reduced in part (f).

Part (h)

Minimum ne obtained for k = 5, and CI obtained in this case is –

[-0.00039167815433066463, 0.00045433547258875014]