Assignment 5 – Part 1

1. **Calculate the defect removal rate for every phase.**

   Defect removal rate = number of defects removed / 120KLOC

Phase	**Number of Defects removed**	**Defect Removal rate**
Requirement	223	1.858
Analysis	136	1.133
Design	311	2.591
Coding	508	4.233
Unit testing	244	2.033
Integration Testing	111	0.925
System Testing	67	0.558
Field	18	0.15

2. **Calculate the defect injection rate for every phase**.

   Defect injection rate = number of defects injected / 120 KLOC

Phase	Number of Injected Defects	Defect Injectional rate
Requirement	542	4.52
Analysis	207	1.73
Design	373	3.11
Coding	472	3.94
Unit testing	4	0.04
Integration Testing	7	0.06
System Testing	6	0.05
Field	7	0.06

3. **Calculate the defect escape rate for every phase.**

   Defect escape rate = Number of defects escaped / 120 KLOC

   Number of defects escaped = Number of defects injected + Number of defects escaped from prior phase – Number of defects removed.

Phase	Total Number of Defects Injected (A)	Total Number of Defects Escaped from prior phase (B)	Total number of defects removed (C)	Total number of defects escaped. (A+B-C)	Defect escape rate
Requirement	542	0	223	319	2.658
Analysis	207	319	136	390	3.25
Design	373	390	311	452	3.766
Coding	472	452	508	416	3.466
Unit testing	4	416	244	176	1.466
Integration Testing	7	176	111	72	0.6
System Testing	6	72	67	11	0.091
Field	7	11	18	0	0

4. **Calculate the overall defect removal effectiveness.**

Overall defect removal effectiveness = [(1 – (Defects in field / Total defects)] * 100
Overall defect removal effectiveness = (1 – 18/1618) * 100 = 98.88%

5. **Which phase is the most effective in removing defects? Explain.**

Defect removal effectiveness = No. of defects found / no. of defects injected from previous Phase + No. of defects injected.

Phase wise defect removal effectiveness
Requirement = [223 / 542] *100 = 41.143%
Analysis = [136 / (207+319)] *100 = 25.855%
Design = [311 / (373+390)] *100 = 40.76%
Coding = [508 / (472+452)] *100= 54.978%
Unit testing = [244 / (4+416)] *100= 58.095%
Integration testing = [111 / (7+176)] *100 = 60.655%
System testing = [67 / (6+72)] *100 = 85.897%
Field = [18 / (7+11)] *100 = 100%

As we can see in the calculation, the most effective phase is system testing with defect removal rate 85.897%.

For testing phase, we use below formula.

= (Defect removal at current phase / (Defect removal at current phase + Defect removal at subsequent phase)) defects / KLOC

Phase	Defects removes in this Phase	Defects removes in this Phase + subsequent Phase	Dunn's Defect removal effectiveness (%)
Unit Testing	244	244+(111+67+18) = 440	55.454%
Integration testing	111	111+(67+18) = 196	56.632%
System testing	67	67+(18) = 85	78.823%

Based on the above table, the most effective phase in defect removal is system testing and effectiveness of that phase is 78.823%.

6. **Do you think review and inspections were effective? Explain**

Overall defect removal effectiveness is 98.887%.

Overall Inspection efficiency = (defects removed in Inspection / Total defects) * 100
= ((223+136+311+508)/1618) *100
= 72.805%

As a greater number of defects were identified in coding phase, even by considering all the phases, we can say that review and inspection are very effective for the defect removal.

We can also interpret that overall defect removal effectiveness is greater than CMMI 5 criteria.

7. **If the number of defects originated in design phase increased by 15% and defects detected in design review increased by 60% would this change increase or decrease the defects escaped to the coding phase? Explain your answer in detail (present data to support your answer).**

Phases	Requirement	Analysis	Design	Coding	Unit Testing	Integration Testing	System Testing	Field	Total
Requirement	223								223
Analysis	102	34							136
Design	89.60	72	336						497.6
Coding	97	71	71.3	278					517.3
Unit Testing	43	31	49.45	123	4				250.45
Integration Testing	12	21	39.1	37		7			116.1
System Testing	7	4	24.15	29			6		70.15
Field	2	1	3.35	5				7	18.35
Total	575.6	234	523.35	472	4	7	6	7	

Defect Escape rate = Defects escaped / Product size in KLOC

Product Size:120 KLOC

Phase	Defects Detected	Defect Injected	Defects escaped	Defect escape rate
Requirement	223	575.6	575.6 – 223 = 352.6	2.93 defects/KLOC
Analysis	136	234	575.6 + 234 – 223 – 136 = 450.6	3.75 defects/KLOC
Design	497.6	523.35	575.6 + 234 + 523.35 + 472 – 223 – 136 – 497.6 – 517.3 = 431.05	3.96 defects/KLOC
Coding	517.3	472		3.59 defects/KLOC

- For coding phase, considering default values, we get the defect escape rate 3.4666.
- After increasing defects origin at design phase by 15% and defects detected in design review by 60%, we get the defect escape rate is 3.59.
- So, there is an increase in number of defects escaped to the coding phase.