# BLG411E-SOFTWARE ENGINEERING
# Midterm Exam Solutions
# 23/11/2004

**Answer 1a) Estimated Counts:**

**User inputs (Each distinct data is counted):**
Customer name, address, phone, debt limit amount.
Date of sale, comments, sale amount, downpayment amount, debt amount, number of instalments.
(Total=10)

**User outputs:**

i) Reports:
List of delinquent customers.
List of debted customers.
Voucher documents.

ii) On-line result screens:
A given customer's all information.
The overall total amount of all customer debts.

iii) Error messages:
Warning message for exceeding debt limit.

(Total=6)

**User inquiries (On-line commands and inquiry inputs):**
Getting user commands from menu.
Getting a customer's name for a transaction (sale, payment, inquiry).
(Total=2)

**Files (database tables):**
Customers.
Sales.
Instalments.
(Total=3)

We will use the average empirical weights:

| Measurement parameter | Estimated Count | Average Weight | FP_count |
|---|---|---|---|
| Number of user inputs | 10 | 4 | 40 |
| Number of user outputs | 6 | 5 | 30 |
| Number of user inquiries | 2 | 4 | 8 |
| Number of files | 3 | 10 | 30 |
| Number of external interfaces | 0 | 7 | 0 |
| COUNT_TOTAL = | | | 108 |

**Complexity Adjustment Factors (CAF):**

| **Factor** | **Our Estimation** |
|---|---|
| 1.Backup and recovery | 5 |
| 2.Data communications | 1 |
| 3.Distributed processing | 0 |
| 4.Performance critical | 2 |
| 5.Existing operating environment | 0 |
| 6.On-line data entry | 5 |
| 7.Input transaction over multiple screens | 3 |
| 8.Master files updated on-line | 5 |
| 9.Information domain values complex | 2 |
| 10.Internal processing complex | 2 |
| 11.Code designed for reuse | 1 |
| 12.Conversion/installation in design | 0 |
| 13.Multiple installations | 0 |
| 14.Application designed for change | 1 |
| | + |
| Factor_total = | 27 |

**Scales:**

| | |
|---|---|
| 0=No influence | 3=Average |
| 1=Incidental | 4=Significant |
| 2=Moderate | 5=Essential |

Function Points formula:

FP = Count_total * (0.65 + 0.01 * Factor_total)

= 108 * (0.65 + 0.01 * 27)

= 108 * 0.92

≅ 100

**LOC** = $100_{FP} * 30_{LOC/FP} = 3000$ lines of code in C++ language.

**KLOC =** 3

**Answer 1b)**

**Effort Adjustment Factors (EAF):**

| **Factor** | **Range of Factor** | **Our Estimation** |
|---|---|---|
| Product Attributes | | |
| 1.Required reliability | 0.75 – 1.40 | 1.40 |
| 2.Database size | 0.94 – 1.16 | 0.98 |
| 3.Product complexity | 0.70 – 1.65 | 0.95 |
| Computer Attributes | | |
| 4.Execution time constraint | 1.00 – 1.66 | 1.00 |
| 5.Main storage constraint | 1.00 – 1.56 | 1.20 |
| 6.Virtual machine volatility | 0.87 – 1.30 | 0.87 |
| 7.Computer turnaround time | 0.87 – 1.15 | 0.87 |
| Personnel Attributes | | |
| 8.Analyst capability | 1.46 – 0.71 | 1.46 |
| 9.Programmer capability | 1.42 – 0.70 | 0.75 |
| 10.Application experience | 1.29 – 0.82 | 0.85 |
| 11.Virtual machine experience | 1.21 – 0.90 | 1.00 |
| 12.Programming language experience | 1.14 – 0.95 | 0.95 |
| Project Attributes | | |
| 13.Use of modern programming practices | 1.24 – 0.82 | 0.82 |
| 14.Use of SW tools | 1.24 – 0.83 | 0.90 |
| 15.Required development schedule | 1.23 –1.10 | 1.10 |
| | | x ——— |
| | | EAF = 0.85 |

Intermediate COCOMO formulas:

$PM = a * (KLOC)^b * EAF$

$T_{dev} = c * (PM)^d$

We will consider the type of this project as semi-detached. Therefore, the following empirical weights will be used:

| SW Category | a | b | c | d |
|---|---|---|---|---|
| Semi-detached | 3.0 | 1.12 | 2.5 | 0.35 |

| | | |
|---|---|---|
| $PM = a * (KLOC)^b * EAF$<br>$= 3.0 * (3)^{1.12} * 0.85$<br>$= 8.7$ person-months | $T_{dev} = c * (PM)^d$<br>$= 2.5 * (8.7)^{0.35}$<br>$= 5.3$ months | Number of people = $PM / T_{dev}$<br>$= 8.7 / 5.3$<br>$= 1.6$<br>$\cong 2$ |

**Answer 2)** Typical Software Configration Items (SCI):

1. System Specification
2. Software Project Plan
3. Software Requirements Specification
4. Design Specification
5. Source Code Listing
6. Test Plans/Procedures
7. Installation/Operation/User Manuals
8. Executable Software