BLG411E - Software Engineering

Midterm Exam - 11.11.2008

•Books and notes closed   •Calculator and dictionary allowed   •Exam duration 1.5 hours

PROBLEM (70 points)

A technical service firm needs a web-based software to keep track of maintenance and repairment operations for their customers' devices such as combi, air conditioner, laundry machine, refrigirator, etc.
The followings are functional requirements:

- A Service Request Form must be filled for all kinds of service requests. The form must contain fields for customer name, address, telephone, and a description of service being requested.
- The request will be tracked by a status code: "Device will be picked up from customer"; "Device will be serviced at customer's place"; "Device is in service"; "Device waiting for delivery to customer"; "Delivery completed", etc.
- A request can be done directly by a customer over the Internet, or an authorized personnel can record the request for the customer.
- Customer should be able to query the status of his service request.
- The manager will assign a service request task to an available technician.
- For each service request the followings should be recorded: Device information (device type, brand, model, warranty status, start date, expiration date); Jobs done at service, Spare parts used if any, Billing amount (YTL).
- Service Request Lists should be available with different criteria: By service registration number, By customer name, By status code, By device type, By request type, By date of request, By technician name.
- For customers who has warranty agreement, periodic maintainances will be tracked. For this purpose, a list of devices which are sorted by warranty expiration date should be available.

Q1) [70 points]

a) [15 points] Using the **Function Points** (unadjusted) method, estimate the **Lines of Code** for the software. Assume that PHP language will be used (70 LOC/FP).

b) [15 points] Using the **COCOMO II Early Design Model** , estimate the effort and the development time; and determine number of people to work on this project.

c) [15 points] Draw Entity-Relationship Diagram (**ERD**).

d) [15 points] Draw Level-1 Data Flow Diagram (**DFD**).

e) [10 points] Draw Hierarchical Structure Chart.

Q2) [15 points] Briefly explain the Sub-models of COCOMO II estimation method.

Q3) [15 points] Briefly explain the Incremental Software Process Model.

COCOMO II Early Design Model Equations

$$PM = A * (KLOC)^E * \prod_{j=1}^{7} EM_j \qquad\qquad E = B + 0.01 * \sum_{j=1}^{5} SF_j$$

$$TDEV = C*(PM)^F \qquad F = D + 0.2*(E-B) \qquad A = 2.94 \quad B = 0.91 \quad C = 3.67 \quad D = 0.28$$

Effort Multipliers (EM)

	Cost Driver	Extra Low	Very Low	Low	Nominal	High	Very High	Extra High
1	PERS	2.12	1.62	1.26	1.00	0.83	0.63	0.50
2	RCPX	0.49	0.60	0.83	1.00	1.33	1.91	2.72
3	RUSE	-	-	0.95	1.00	1.07	1.15	1.24
4	PDIF	-	-	0.87	1.00	1.29	1.81	2.61
5	PREX	1.59	1.33	1.12	1.00	0.87	0.74	0.62
6	FCIL	1.43	1.30	1.10	1.00	0.87	0.73	0.62
7	SCED	-	1.43	1.14	1.00	1.00	1.00	-

PERS - Personnel capability   RCPX - Product reliability and complexity
RUSE - The reuse required   PDIF - Platform difficulty   PREX - Personnel experience
FCIL - The team support facilities   SCED - Required schedule

Scale Factors (SF)

	Scale Factors	Very Low	Low	Nominal	High	Very High	Extra High
1	PREC	6.20	4.96	3.72	2.48	1.24	0.00
2	FLEX	5.07	4.05	3.04	2.03	1.01	0.00
3	RESL	7.07	5.65	4.24	2.83	1.41	0.00
4	TEAM	5.48	4.38	3.29	2.19	1.10	0.00
5	PMAT	7.80	6.24	4.68	3.12	1.56	0.00

PREC - Precedentedness   FLEX - Development flexibility
RESL - Architecture and risk resolution   TEAM -Team cohesion   PMAT - Process maturity

Unadjusted Function Points

Type of Component	Complexity of Components		
	Low	Average	High
External Inputs (EI)	3	4	6
External Outputs (EO)	4	5	7
External Inquiries (EQ)	3	4	6
Internal Logical Files (ILF)	7	10	15
External Interface Files (EIF)	5	7	10