SEMESTER 2, 2015

INF3708: ASSIGNMENT 03 – SOLUTIONS (TUT202)

QUESTION 1 **(Total = 20 marks)**

1.1 Provide the equation and identify the variables in Boehm’s equation for calculating effort in the use of the COCOMO model

Boehm’s equation:

effort = c* (size)^{*k} **(1 mark)**

Variables in Boehm’s equation:

Effort: measured in person months consisting of 152 working hours **(1 mark)**

Size: measured in thousands of delivered source code instructions (*kdsi*) **(1 mark)**

c and k are constants:
The constants, *c* and *k*, depended on whether the system could be classified, in Boehm’s terms, as “organic”, “semi-detached” or “embedded”

(1 mark)

Note: *c* and *k* are constant values derived from Table 2 below.
These relate to the **technical** nature of the system and the **development environment**.

1.2 Five systems with the following estimated lines of code were identified. Identify which can be completed in three years

System	Lines of code	System type
A	10568	Semi-detached mode
B	12572	Semi-detached mode
C	16342	Organic mode
D	8553	Embedded mode
E	7314	Embedded mode

Table1: Question 1 - System Details

System type	c	k
Organic	2.4	1.05
Semi-detached	3.0	1.12
Embedded	3.6	1.20

Table 2: Question 1 – COCOMO constants

1.2 continued…

effort = c* (size)*^{k}

NOTE:
Solve the bracket, then power k before multiplying by c

A	=3.0*(10568/1000)$^{1.12}$	=	42.07	Person months/12 = years	=	3.51 years
B	=3.0*(12572/1000)$^{1.12}$	=	51.10	Person months/12 = years	=	4.26 years
C	=2.4*(16342/1000)$^{1.05}$	=	45.10	Person months/12 = years	=	3.76 years
D	=3.6*(8553/1000)$^{1.20}$	=	47.30	Person months/12 = years	=	3.94 years
E	=3.6*(7314/1000)$^{1.20}$	=	39.20	Person months/12 = years	=	3.27 years
	(5 marks)		**(5 marks)**			**(5 marks)**

Therefore NONE of the systems can be completed in less than 3 years. See last column in table 3 above **(1 mark)**

QUESTION 2 (Total = 12 marks)

The total function point (FP) count of a subsystem to be written consists of 30 unadjusted function points (UFP), calculated according to the IFPUG method developed by Allan Albrecht. The Project Manager (PM) discovered that one FP count did not include a reference to the Personnel File.

This file consists of the following 3 record types:

- General information
- Employment history
- Performance information.

Twenty data types are to be referenced by the program.

2.1 If the file is an internal logical file (ILF), how many FPs must the PM add to the current FP count to make provision for the Personnel file? Explain all the steps. **(8 marks)**

Subsystem: Total function points (FP) of subsystem to be written = 30 unadjusted function points (ufp)

Personnel file:

Internal logical file (ilf): 3 record types
20 data types

Therefore:

file type complexity = Average (Table 5.3, p115 Cotterrell)

According to Albrecht’s complexity multipliers (Table 5.2, p115), This ILF with average complextity has 10 FPs

10 FPs must be added to the subsystem

2.2 What would the difference in FP be, if the file was an external interface file (EIF)? **(4 marks)**

If it was an external interface file (EIF) with 3 record tytpes, and 20 data types

file type complexity = Average (Table 5.3, p115 Cotterrell)
According to Albrecht’s complexity multipliers (Table 5.2, p115), This EIF with average complextity has 7FPs

7 FPs would be added to the subsystem

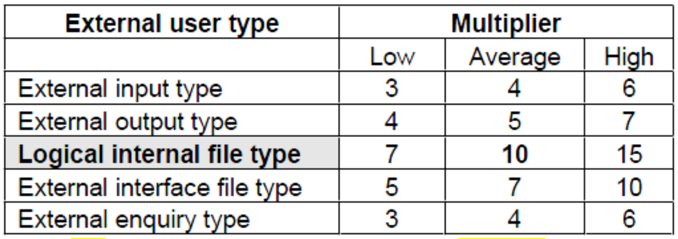
Detailed explanations……………….Q2.1

The **first** step is to determine which method to use. Since the IFPUG or Albrecht Function

Point method has been used to calculate the FPs thus far, it makes sense to continue in this vain.

The **second** step (when using IFPUG) is to identify what type of object is to be evaluated.

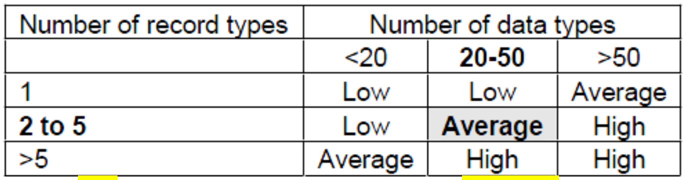
Table 5.2 (page 115 of Hughes & Cotterell) indicates five External user types. According to the question, the additional object is of a ***logical internal file type, also referred to as an ILF or internal logical file***.



External user type	Multiplier		
	Low	Average	High
External input type	3	4	6
External output type	4	5	7
Logical internal file type	7	**10**	15
External interface file type	5	7	10
External enquiry type	3	4	6

Table 5.2 Albrecht complexity multipliers (p. 115)

The **third** step is to determine the complexity of the object (high, medium or low). The method to do this is prescribed by IFPUG and contained in tables 5.3 (page 115) For logical internal files and external interface files, table 5.3 is. Since we already know that we are dealing with ***logical internal files,*** we now know to use ***table 5.3 (IFPUG file type complexity)***.



Number of record types	Number of data types		
	<20	**20-50**	>50
1	Low	Low	Average
2 to 5	Low	**Average**	High
>5	Average	High	High

Table 5.3 IFPUG file type complexity (p. 115)

In step **four** we have to identify the number of record types and data types. According to the question there are ***three record types*** and ***twenty data types*** to be referenced by the program. Reading from table 5.3, the file type complexity will thus be ***average.***

In step **five** we use table 5.2 to determine the complexity multiplier for a logical internal file type of average complexity, which is **10**.

Step **six** we multiply the multiplier with the number of files to be added (1) to determine the Fps: = 10 and add these to the existing Fps calculated (30) resulting in a new UFP count of

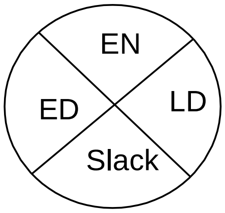
40.

Detailed explanations……………….Q2.2

Using the Q2.1 explanation, it is found that, for Q2.2, the new UFP count will be **37** (i.e., (7*1)+30) if the file was an external interface file (EIF) type. The difference is therefore a UFP count of 3 (i.e., 40-37).

QUESTION 3 **(Total = 23 marks)**

3.1 There are a number of different conventions that have been adopted for entering information on network and activity planning diagrams, such as activity-on-arrow networks and the Precedence or activity-on-node network diagrams. Give the naming convention of events for activity-on-arrow networks **as well as** for the nodes in Precedence (or activity-on-node network) diagram as used in Hughes & Cotterel. **(8 marks)**



Key
EN – Event number
ED – Earliest date
LD – Latest date
Slack

Activity-on-arrow network diagram

Early Start	Duration	Early Finish
	Task Name	
Late Start	Slack	Late Finish

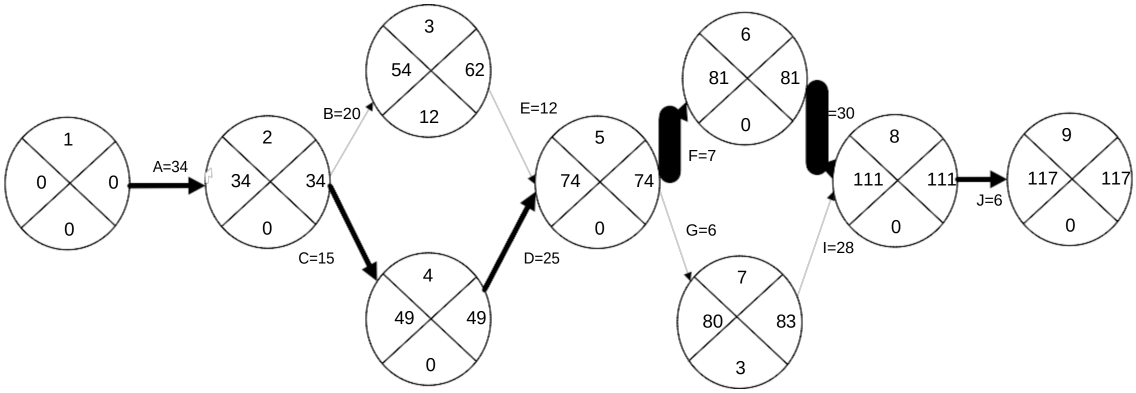
Precedence or activity-on-node network diagram

3.2 Consider the following activities with their precedents and durations. **(15 marks)**

Activity	Precedents	Estimated duration (days)
A	None	34
B	A	20
C	A	15
D	C	25
E	B	12
F	D, E	7
G	D, E	6
H	F	30
I	G	28
J	I, H	6

Draw a complete Activity-on-arrow network diagram. Include the event number, earliest date, latest date and slack on each node by completing both a forward and backward pass. Clearly indicate the total duration and critical path.

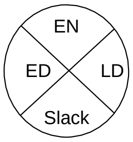
Question 3.2



Key

EN – Event number
ED – Earliest date
LD – Latest date
Slack

→ Critical Path



Activity-on-arrow network diagram (✓)