**EXPERIMENT – 02**

**Aim:** Using COCOMO model, estimate effort

**Objective:** Estimating effort for developing Attendance managementSystem project using COCOMO model

**Theory:**

Boehm postulated that any software development project can be classified into one of the following three categories based on the development complexity: organic, semidetached, and embedded. In order to classify a product into the identified categories, Boehm not only considered the characteristics of the product but also those of the development team and development environment. Roughly speaking, these three product classes correspond to application, utility and system programs, respectively. Normally, data processing programs are considered to be application programs. Compilers, linkers, etc., are utility programs. Operating systems and real-time system programs, etc. are system programs. System programs interact directly with the hardware and typically involve meeting timing constraints and concurrent processing.

**Organic**:

A development project can be considered of organic type, if the project deals with developing a well understood application program, the size of the development team is reasonably small, and the team members are experienced in developing similar types of projects.

**Semidetached:**

A development project can be considered of semidetached type, if the development consists of a mixture of experienced and inexperienced staff. Team members may have limited experience on related systems but may be unfamiliar with some aspects of the system being developed.

**Embedded:**

A development project is considered to be of embedded type, if the software being developed is strongly coupled to complex hardware, or if the stringent regulations on the operational procedures exist.

**COCOMO (Constructive Cost Estimation Model)** was proposed by Boehm[1981]. According to Boehm, software cost estimation should be done through three stages: Basic COCOMO, Intermediate COCOMO and Complete COCOMO.

 **BASIC COCOMO MODEL:**

The basic COCOMO model gives an approximate estimate of the project parameters. The basic COCOMO estimation model is given by the following expressions: 

Effort = a1х (KLOC) a2 pm

Tdev = b1x (Effort) b2 Months

P= Effort/ Tdev

Where KLOC is the estimated size of the software product expressed in Kilo Lines of Code, and P is the no of persons required to complete the work and**a1, a2** **, b1, b2** are constants for each category of software products, Tdev is the estimated time to develop the software, expressed in months,Effort is the total effort required to develop the software product, expressed in person-months (PMs).

The coefficients **a1, a2** **, b1, b2** for various types of software projects

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Software** | **a1** | **a2** | **b1** | **b2** |
| **Projects** |  |  |  |  |
|  |  |  |  |  |
| Organic | 2.4 | 1.05 | 2.5 | 0.38 |
|  |  |  |  |  |
| Semi-detached | 3.0 | 1.12 | 2.5 | 0.35 |
|  |  |  |  |  |
| Embedded | 3.6 | 1.20 | 2.5 | 0.32 |
|  |  |  |  |  |

Estimation of development effort For the three classes of software products, the formulas for estimating the effort based on the code size

|  |  |  |
| --- | --- | --- |
| are shown below: |  |  |
| Organic | : Effort = 2.4(KLOC)1.05 | PM |
| Semi-detached: | Effort = 3.0(KLOC)1 .12 | PM |
| Embedded | : Effort = 3.6(KLOC)1.20 | PM |

For the three classes of software products, the formulas for estimating the development time based on the effort are given below:

0.38

Organic: Tdev = 2.5(Effort) Months Semi-

0.35

detached: Tdev = 2.5(Effort) Months

0.32

Embedded: Tdev = 2.5(Effort) Months

**Example:**

Effort Calculation for Attendance Maintenance System Consider Lines of Code = 10000

i.e value of KLOC is 10

Organic : Effort = 2.4(KLOC)1.05 PM

* + 2.4\*(10 )1.05
* 2.4 \* 11.220
  + 26.92 pm

Semi-detached: Effort = 3.0( 10 )1.12 PM

|  |  |
| --- | --- |
|  | =3.0\*13.18 |
|  | =39.5 pm |
| Embedded | : Effort = 3.6(10 )1.20 PM |
|  | = 3.6\*15.84 |
|  | = 57.02PM |