Considering your immense expertise in software development, The Absolute Beginners Inc. has recently allotted you a mega project. The goal of the project is to create a database of all Hindi films released since 2000. The software would allow one to generate a list of top ten hit films, top ten flop films, best comedy films, and so on. Using your prior experience you have decided the approximate sizes of each module of the software as follows:

- Data entry (0.9 KDSI)
- Data update (0.7 KDSI)
- Query (0.9 KDSI)
- Report generation and display (2 KDSI)

Also take into consideration the following cost drivers with their ratings:

- Storage constraints (Low)
- Experience in developing similar software (High)
- Programming capabilities of the developers (High)
- Application of software engineering methods (High)
- Use of software tools (High)

(All other cost drivers have nominal rating).

1. Now answer the following:

- Applying intermediate COCOMO estimate the effort required to develop this system.
- Applying intermediate COCOMO estimate the time required to develop this system.
- Calculate the phase wise effort percentage for the above application.
- Applying intermediate COCOMO estimate the minimum size of the team you would require to develop this system.
- Assuming that your client would pay Rs. 50,000 per month of development, how much would be the likely billing?

Step 1: Calculate Effort
The formula for calculating effort using Intermediate COCOMO is: Effort = a * (Size)^b * EAF

Where:

- a = 3.2 (constant)
- b = 1.05 (constant)
- Size = Sum of KDSI values for modules (Data entry + Data update + Query + Report generation and display)
- EAF = Product of cost drivers' ratings

Given KDSI values:

- Data entry = 0.9 KDSI
- Data update = 0.7 KDSI
- Query = 0.9 KDSI
- Report generation and display = 2 KDSI

Size = 0.9 + 0.7 + 0.9 + 2 = 4.5 KDSI

Given cost drivers' ratings:

- Storage constraints = Low (1)
- Experience = High (0.86)
- Programming capabilities = High (0.95)
- Application of software engineering methods = High (0.91)
- Use of software tools = High (0.91)

EAF = Low * High * High * High * High = 1.0 * 0.86 * 0.95 * 0.91 * 0.91 = 0.677
Effort = 3.2 * (4.5)^1.05 * 0.677 ≈ 10.51 Person-Months

Step 2: Calculate Time
The formula for calculating time using Intermediate COCOMO is:
Time = c * (Effort)^c
Where:
c = 0.38 (constant)
Time = 2.5 * (10.51)^0.38 = 6.11 Months

Step 3: Calculate Phase-Wise Effort Percentage
Data entry = (0.9 / 4.5)^1.05 * 100% ≈ 18.5%
Data update = (0.7 / 4.5)^1.05 * 100% ≈ 14.17%
Query = (0.9 / 4.5)^1.05 * 100% ≈ 18.45%
Report generation and display = 2 / 4.5 * 100% ≈ 42.68%

Step 4: Calculate Minimum Team Size
Minimum Team Size = Effort / Time = 10.51 / 6.11 ≈ 2 Developers

Step 5: Calculate Likely Billing

Given that the client pays Rs 50000 per month for development, the likely billing for the project would be as follows:
Cost per month of development * Time for development
= Rs 50,000 * 6.11 = Rs 3,05,500