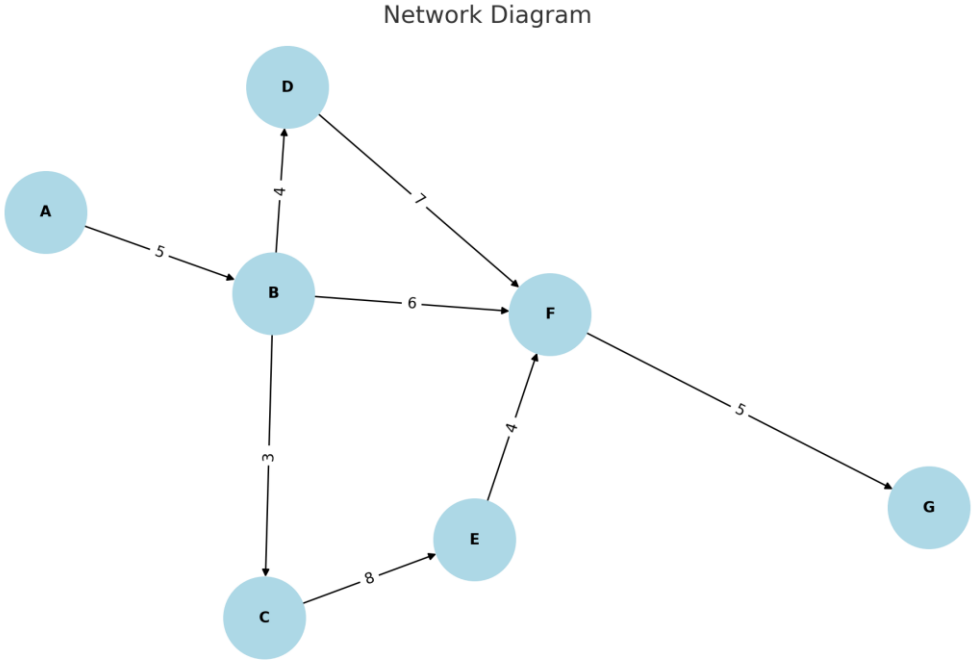
No	QUESTIONS+SOLUTION
1	"For the given activities, draw the network diagram, identify the critical path and its duration. A-->B = 5 Days B-->C = 3 Days B-->D = 4 Days B-->F = 6 Days C-->E = 8 Days D-->F = 7 Days E-->F = 4 Days F-->G = 5 Days" **Solution:** To solve the problem, we will follow these steps: 1. **Draw the Network Diagram**: o Represent each activity as an arrow, with the tasks labeled (e.g., A, B, C). o Connect the activities based on their dependencies. 2. **Calculate the Duration**: o Add the durations of activities along each path to find the total duration for that path. 3. **Identify the Critical Path**: o The critical path is the longest path from the start to the end of the project, as it determines the minimum project duration. Let's start by constructing the network diagram and solving this.  The **network diagram** has been constructed (as shown above), and the analysis reveals the following: **Critical Path and Duration:** • **Critical Path**: A → B → C → E → F → G • **Duration**: 25 Days This is the longest path in the network, determining the minimum time required to complete the project.
2	"Compute Estimate At Completion (EAC) and Variance At Completion (VAC) if both SPI and CPI influence the project work when given variables are • Budget At Completion (BAC) = 50 Lakh Rupees • Earned Value (EV) = 20 Lakh Rupees • Planned Value (PV) = 30 Lakh Rupees

	• Actual Cost (AC) = 35 Lakh Rupees Also, identify whether the project is behind schedule and whether the project is within the budget." **Solution:** To calculate the **Estimate at Completion (EAC)** and **Variance at Completion (VAC)**, we need to use the following formulas: To calculate the **Estimate at Completion (EAC)** and **Variance at Completion (VAC)**, we need to use the following formulas: 1. **Cost Performance Index (CPI)**: $$CPI = \frac{EV}{AC}$$ 2. **Schedule Performance Index (SPI)**: $$SPI = \frac{EV}{PV}$$ 3. **Estimate at Completion (EAC)** when both CPI and SPI are considered: $$EAC = \frac{BAC}{CPI \times SPI}$$ 4. **Variance at Completion (VAC)**: $$VAC = BAC - EAC$$ Let's compute the values and determine the project status. **Results:** • **Cost Performance Index (CPI)**: 0.57 (indicating the project is over budget) • **Schedule Performance Index (SPI)**: 0.67 (indicating the project is behind schedule) • **Estimate at Completion (EAC)**: 131.25 Lakh Rupees • **Variance at Completion (VAC)**: -81.25 Lakh Rupees (indicating the project will be over budget by 81.25 Lakh Rupees) **Project Status:** • **Behind Schedule**: Yes (SPI < 1) • **Within Budget**: No (EAC > BAC) The project is both **behind schedule** and will exceed the initial budge
3	In a software project, three risks were identified. (1) 75% chance of losing 50 thousand Rupees due to delayed delivery of reports module. (2) 5% chance of spending of 30 Lakh Rupees due to customer changing product specifications. (3) 20% chance of wasting 2 Lakhs due to delay in loading of customer supplied data. Calculate the combined risk exposure of the project. **Solution:**

	To calculate the **combined risk exposure**, we use the following formula for **Risk Exposure (RE)**: $$RE = \text{Probability} \times \text{Impact}$$ We will calculate the risk exposure for each identified risk and then sum them up to get the combined risk exposure. **Given Risks:** 1. **Risk 1**: 75% chance of losing 50 thousand Rupees $$RE_1 = 0.75 \times 50,000$$ 2. **Risk 2**: 5% chance of spending 30 Lakh Rupees $$RE_2 = 0.05 \times 30,00,000$$ 3. **Risk 3**: 20% chance of wasting 2 Lakh Rupees $$RE_3 = 0.20 \times 2,00,000$$ Now, we will calculate the total combined risk exposure. **Individual Risk Exposures:** 1. **Risk 1** (Delayed delivery of reports module): 37,500 Rupees 2. **Risk 2** (Customer changing product specifications): 1,50,000 Rupees 3. **Risk 3** (Delay in loading customer-supplied data): 40,000 Rupees **Combined Risk Exposure:** The total combined risk exposure of the project is **2,27,500 Rupees**
4	Compute *Estimate At Completion* (EAC) and *Variance At Completion* (VAC) if both SPI and CPI influence the project work when given variables are • Budget At Completion (BAC) = 22 Lakh Rupees • Earned Value (EV) = 13 Lakh Rupees • Planned Value (PV) = 14 Lakh Rupees • Actual Cost (AC) = 15 Lakh Rupees Also, identify whether the project is behind schedule and whether the project is within the budget. **Solution:**

To calculate the **Estimate at Completion (EAC)** and **Variance at Completion (VAC)**, we will use the following formulas, considering both the **Cost Performance Index (CPI)** and **Schedule Performance Index (SPI)**:

1. **Cost Performance Index (CPI)**:

$$CPI = \frac{EV}{AC}$$

2. **Schedule Performance Index (SPI)**:

$$SPI = \frac{EV}{PV}$$

3. **Estimate at Completion (EAC)** when both CPI and SPI are considered:

$$EAC = \frac{BAC}{CPI \times SPI}$$

4. **Variance at Completion (VAC)**:

$$VAC = BAC - EAC$$

Given values:

- **BAC** (Budget at Completion) = 22 Lakh Rupees
- **EV** (Earned Value) = 13 Lakh Rupees
- **PV** (Planned Value) = 14 Lakh Rupees
- **AC** (Actual Cost) = 15 Lakh Rupees

Step 1: Calculate SPI (Schedule Performance Index)

$$SPI = \frac{EV}{PV} = \frac{13,00,000}{14,00,000} = 0.928$$

Interpretation: Since SPI < 1, the project is **behind schedule**.

Step 2: Calculate CPI (Cost Performance Index)

$$CPI = \frac{EV}{AC} = \frac{13,00,000}{15,00,000} = 0.867$$

Interpretation: Since CPI < 1, the project is **over budget**.

Step 3: Compute Estimate At Completion (EAC)

Since both SPI and CPI influence the project work, the formula used is:

$$EAC = \frac{BAC}{CPI \times SPI}$$

$$EAC = \frac{22,00,000}{0.867 \times 0.928}$$

$$EAC = \frac{22,00,000}{0.805} \approx ₹27,329,19$$

Interpretation: The new estimated total cost at completion is ₹ 27.33 Lakh.

Step 4: Compute Variance At Completion (VAC)

$$VAC = BAC - EAC$$

$$VAC = 22,00,000 - 27,32,919 = -5,32,919$$

Interpretation: Since VAC < 0, the project will **exceed the budget** by ₹ 5.33 Lakh.

Hence,
The project is behind schedule (SPI = 0.928 < 1) and project is over budget (CPI = 0.867 < 1). The estimated cost at completion is ₹ 27.33 Lakh, which is ₹ 5.33 Lakh over the planned budget.

5 For the given activities, draw the network diagram, identify the critical path and its duration.

Activity	Optimistic	Most Likely	Pessimistic
1 – 2	4	6	8
1 – 3	2	3	10
1 – 4	6	8	16
2 – 4	1	2	3
3 – 4	6	7	8
3 – 5	6	7	14
4 – 6	3	5	7
4 – 7	4	11	12
5 – 7	2	4	6
6-7	2	9	10

Solution:

Step 1: Calculate Expected Time (TE) for Each Activity

We will use the PERT formula:

$$TE = \frac{Optimistic + 4(Most\ Likely) + Pessimistic}{6}$$

Activity	Optimistic	Most Likely	Pessimistic	Expected Time (TE)
1 – 2	4	6	8	$\frac{4+4(6)+8}{6} = 6$
1 – 3	2	3	10	$\frac{2+4(3)+10}{6} = 4$
1 – 4	6	8	16	$\frac{6+4(8)+16}{6} = 9$
2 – 4	1	2	3	$\frac{1+4(2)+3}{6} = 2$
3 – 4	6	7	8	$\frac{6+4(7)+8}{6} = 7$
3 – 5	6	7	14	$\frac{6+4(7)+14}{6} = 8$
4 – 6	3	5	7	$\frac{3+4(5)+7}{6} = 5$
4 – 7	4	11	12	$\frac{4+4(11)+12}{6} = 10$
5 – 7	2	4	6	$\frac{2+4(4)+6}{6} = 4$
6 – 7	2	9	10	$\frac{2+4(9)+10}{6} = 8$

Step 2: Draw the Network Diagram

The network includes the following paths:

1. **Path 1:** 1 → 2 → 4 → 6 → 7
2. **Path 2:** 1 → 2 → 4 → 7
3. **Path 3:** 1 → 3 → 4 → 6 → 7
4. **Path 4:** 1 → 3 → 4 → 7
5. **Path 5:** 1 → 3 → 5 → 7
6. **Path 6:** 1 → 4 → 6 → 7
7. **Path 7:** 1 → 4 → 7

Step 3: Calculate Path Durations

We sum the expected times (TE) along each path:

1. **Path 1:** $6 + 2 + 5 + 8 = 21$
2. **Path 2:** $6 + 2 + 10 = 18$
3. **Path 3:** $4 + 7 + 5 + 8 = 24$
4. **Path 4:** $4 + 7 + 10 = 21$
5. **Path 5:** $4 + 8 + 4 = 16$
6. **Path 6:** $9 + 5 + 8 = 22$
7. **Path 7:** $9 + 10 = 19$

Step 4: Identify the Critical Path

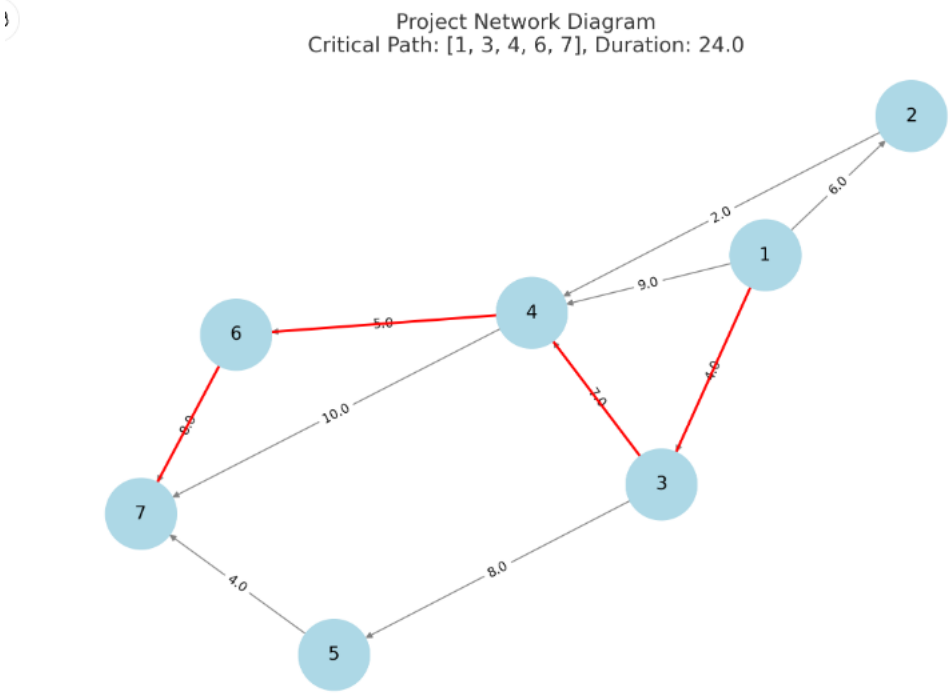
The longest path determines the critical path.

- **Critical Path:** 1 → 3 → 4 → 6 → 7
- **Duration:** 24

Step 5: Conclusion

Network Summary:

- **Critical Path:** 1 → 3 → 4 → 6 → 7
- **Critical Path Duration:** 24



Here's the network diagram for the given project activities.

- **Critical Path:** 1 → 3 → 4 → 6 → 7
- **Critical Path Duration:** 24.0 units of time

6	A project size of 200 KLOC is to be developed. Software development team has average experience on similar type of projects. The project schedule is not very tight. Calculate the Effort, development time, average staff size, and productivity of the project. (Hint: Use semi-detached model where $a_1 = 3$, $a_2 = 1.12$, $b_1 = 2.5$ and $b_2 = 0.35$ **Solution:**

To calculate the **Effort**, **Development Time**, **Average Staff Size**, and **Productivity** of the project using the **Semi-Detached Model** (based on COCOMO II), we will use the following formulas:

Formulas:

1. **Effort (E)**:

$$E = a_1 \times \text{KLOC}^{b_1}$$

2. **Development Time (T)**:

$$T = a_2 \times E^{b_2}$$

3. **Average Staff Size (S)**:

$$S = \frac{E}{T}$$

4. **Productivity (P)**:

$$P = \frac{\text{KLOC}}{E}$$

Let's proceed with the calculations based on these formulas.
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7 You are managing a project which is into six months of its execution. You are now reviewing the project status and you have ascertained that project is behind schedule. The actual cost of Activity A is ₹ 2,00,000 and that of Activity B is ₹ 1,00,000. The planned value of these activities are ₹ 1,80,000 and ₹ 80,000 respectively. The Activity A is 100% complete. However, Activity B is only 75% complete. Calculate the schedule performance index and cost performance index of the project on the review date.

Solution:

To calculate the **Schedule Performance Index (SPI)** and **Cost Performance Index (CPI)**, we will use the following formulas:

Formulas:

1. **Schedule Performance Index (SPI)**:

$$SPI = \frac{EV}{PV}$$

Where:

- **EV** (Earned Value) = Actual work performed (percentage completion × Planned Value)

2. **Cost Performance Index (CPI)**:

$$CPI = \frac{EV}{AC}$$

Where:

- **EV** (Earned Value) is the same as above.
- **AC** (Actual Cost) is the total cost incurred so far.

Given values:

- **Activity A:**
  - Actual Cost (AC) = ₹2,00,000
  - Planned Value (PV) = ₹1,80,000
  - Completion = 100%
- **Activity B:**
  - Actual Cost (AC) = ₹1,00,000
  - Planned Value (PV) = ₹80,000
  - Completion = 75%

Let's calculate the SPI and CPI for the project.

For **Earned Value (EV)**:

- **EV for Activity A** = 100% of ₹1,80,000 = ₹1,80,000
- **EV for Activity B** = 75% of ₹80,000 = ₹60,000

Thus:

- **Total EV** = ₹1,80,000 + ₹60,000 = ₹2,40,000

The **total AC** is:

- **AC for Activity A** = ₹2,00,000
- **AC for Activity B** = ₹1,00,000
- **Total AC** = ₹2,00,000 + ₹1,00,000 = ₹3,00,000

Let's now compute the **SPI** and **CPI**.

1. **SPI** = EV / PV
2. **CPI** = EV / AC

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For the given activities, draw the network diagram, identify the critical path and its duration.

Activity	Optimistic	Most Likely	Pessimistic
1 -- 2	6	9	12
1 -- 3	3	4	11
2 -- 4	2	5	14
3 -- 4	4	6	8
3 -- 5	1	1.5	5
2 -- 6	5	6	7
4 -- 6	7	8	15
5 -- 6	1	2	3

Solution:

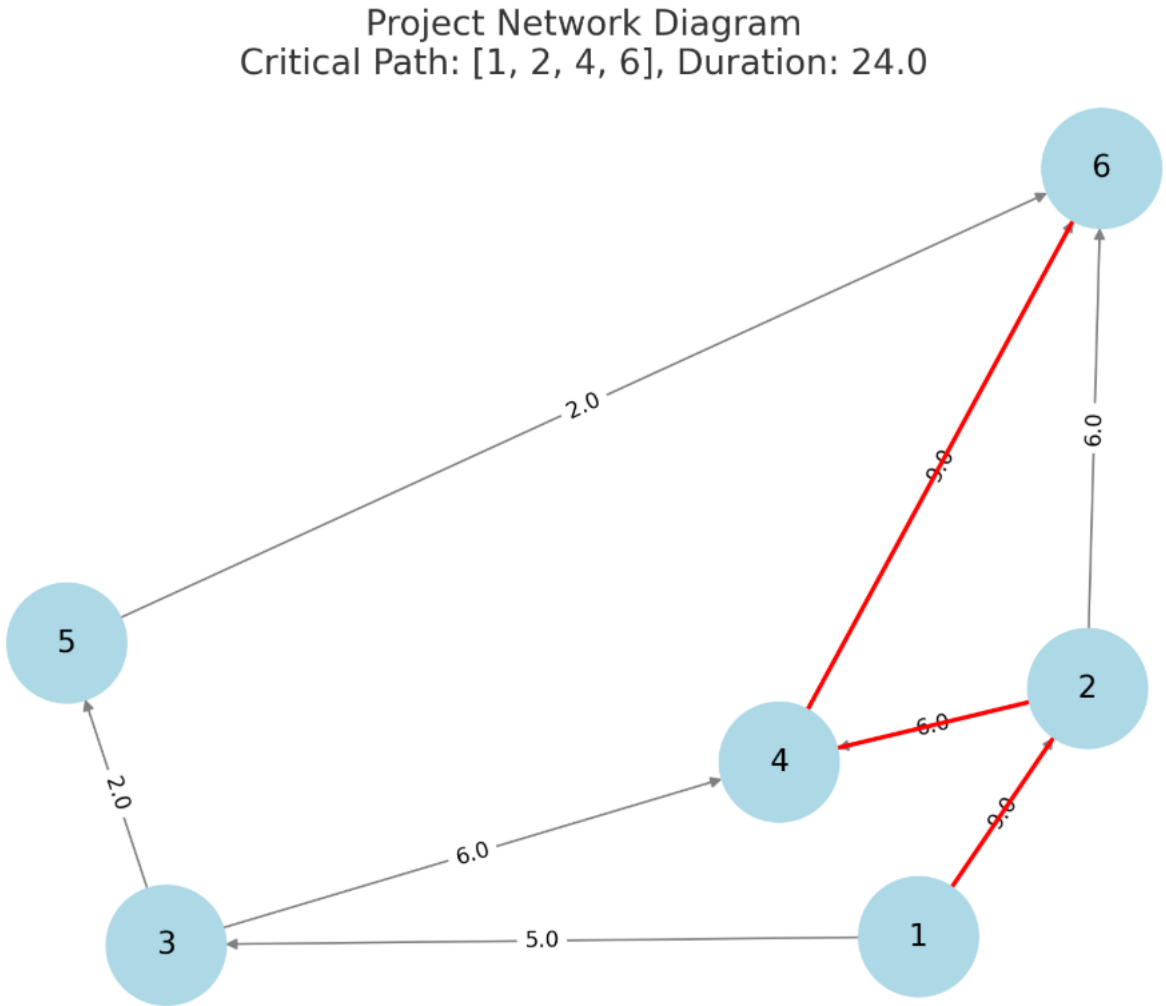
The expected times (TE) for each activity are:

Activity	Expected Time (TE)
1 → 2	9.0
1 → 3	5.0
2 → 4	6.0
3 → 4	6.0
3 → 5	2.0
2 → 6	6.0
4 → 6	9.0
5 → 6	2.0

Step 2: Identify Possible Paths

The network has the following paths:

1. **Path 1:** 1 → 2 → 4 → 6
   - Duration: $9 + 6 + 9 = 24$
2. **Path 2:** 1 → 2 → 6
   - Duration: $9 + 6 = 15$
3. **Path 3:** 1 → 3 → 4 → 6
   - Duration: $5 + 6 + 9 = 20$
4. **Path 4:** 1 → 3 → 5 → 6
   - Duration: $5 + 2 + 2 = 9$



Here's the network diagram for the given activities.

- **Critical Path:** 1 → 2 → 4 → 6
- **Critical Path Duration:** 24 units of time