Solutions to Civil Engineering Licensure Exam – Construction Project Scheduling (PERT/CPM)

February 24, 2025

March 2, 2025

1 Multiple Choice Questions (MCQs)

1. **The Critical Path Method (CPM) is used to:**

   Solution: (a) Determine the longest path in a project schedule.

   Video Explanation: CPM - Critical Path Method & PERT — Solved Problems — Full Course

2. **In PERT analysis, the expected duration (TE) of an activity is given by:**

   Solution: (a) $TE = \frac{O+4M+P}{6}$

   Video Explanation: PERT Analysis — Programme Evaluation Review Technique — Problem 1

3. **The float (slack) in a project schedule represents:**

   Solution: (a) The total time an activity can be delayed without delaying the project.

   Video Explanation: CPM - Critical Path Method & PERT — Solved Problems — Full Course

4. **The term "crashing" in CPM refers to:**

   Solution: (a) Shortening the project duration by adding resources.

   Video Explanation: Critical Path — PERT — CPM — Crashing

5. **A project is considered completed on time when:**

   Solution: (c) The total float is zero.

   Video Explanation: CPM - Critical Path Method & PERT — Solved Problems — Full Course

2 Problem-Solving

1. **A construction project has the following activities with their optimistic (O), most likely (M), and pessimistic (P) durations in days:**

Activity	O	M	P
A	3	6	9
B	2	4	6
C	5	8	11
D	4	5	6

Compute the expected duration for each activity.

Solution: The expected duration TE is calculated using the formula:

$$TE = \frac{O + 4M + P}{6}$$

Applying this formula to each activity:

- Activity A: $TE = \frac{3+4(6)+9}{6} = 6$ days
- Activity B: $TE = \frac{2+4(4)+6}{6} = 4$ days
- Activity C: $TE = \frac{5+4(8)+11}{6} = 8$ days
- Activity D: $TE = \frac{4+4(5)+6}{6} = 5$ days

Video Explanation: PERT Analysis — Programme Evaluation Review Technique — Problem 1

2. **A project has four activities with the following durations (in days):**

Activity	Predecessor	Duration
A	–	5
B	A	7
C	A	6
D	B, C	8

Determine the critical path and project duration.

Solution: To determine the critical path, we calculate the total duration of each path from start to finish:

- Path 1: A $\rightarrow$ B $\rightarrow$ D $= 5 + 7 + 8 = 20$ days
- Path 2: A $\rightarrow$ C $\rightarrow$ D $= 5 + 6 + 8 = 19$ days

The critical path is the longest path, which is Path 1: A $\rightarrow$ B $\rightarrow$ D, with a project duration of 20 days.

Video Explanation: CPM - Critical Path Method & PERT — Solved Problems — Full Course

3. **If activity X has an earliest start time of 12 days and a latest start time of 18 days, determine its total float.**

   Solution: Total float is calculated as:

   $$\text{Total Float} = \text{Latest Start Time} - \text{Earliest Start Time}$$

   For activity X:

   $$\text{Total Float} = 18 - 12 = 6 \text{ days}$$

   Video Explanation: CPM - Critical Path Method & PERT — Solved Problems — Full Course

4. **A construction project is scheduled to take 30 days, but due to a delay, the contractor decides to crash a critical activity. If the normal duration of the activity is 8 days with a normal cost of \$4,000, and the crash duration is 5 days with a crash cost of \$7,000, determine the cost per day of crashing.**

   Solution: The cost per day of crashing is calculated as:

   $$\text{Crash Cost per Day} = \frac{\text{Crash Cost} - \text{Normal Cost}}{\text{Normal Duration} - \text{Crash Duration}}$$

   $$\text{Crash Cost per Day} = \frac{7000 - 4000}{8 - 5} = \frac{3000}{3} = 1000 \text{ per day}$$

   Video Explanation: Critical Path — PERT — CPM — Crashing