Cosc 305 Assignment 3:

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Q1:

Given table (interpreted)

Activity	Pre req	Normal time (days)	Crash time (days)	Normal cost	Crash cost
A	–	2	1	$1,200	$1,600
B	A	5	1	$1,500	$4,500
C	B	2	2	$750	$750
D	A	5	3	$2,500	$3,500
E	A	6	4	$3,000	$4,000
F	C,D,E	5	3	$2,000	$3,000

Normal path lengths:

- A–B–C–F = 2+5+2+5 = **14** days (crit path)
- A–D–F = 2+5+5 = 12 days
- A–E–F = 2+6+5 = 13 days

(a) Cost to complete in **14 days** (normal schedule)

Sum of normal costs:

$$1200 + 1500 + 750 + 2500 + 3000 + 2000 = 10,950$$

Answer (a): $10,950

(b) Crash cost per time period (per day):

Compute

$$((\text{CrashCost} - \text{NormalCost})/(\text{NormalTime} - \text{CrashTime})):$$

- A:

$$((1600 - 1200)/(2 - 1) = 400/1 = 400/\text{day})$$

- B:

$$((4500 - 1500)/(5 - 1) = 3000/4 = 750/\text{day})$$

- C:

$$//notPossibleAs750 = 750$$

- D:

$$((3500 - 2500)/(5 - 3) = 1000/2 = 500/\text{day})$$

- E:

$$((4000 - 3000)/(6 - 4) = 1000/2 = 500/\text{day})$$

- F:

$$((3000 - 2000)/(5 - 3) = 1000/2 = 500/\text{day})$$

Ans (b): A $400/day; B$750/day; C N/A; D $500/day; E$500/day; F $500/day.

(c) Crash to complete in 8 days (minimum-cost crash schedule)

Obj: reduce project duration from 14 -> 8 (need 6 days reduction).

Available crash capacity on initial critical path A–B–C–F:

- A: can reduce by 1 day (2 -> 1)
- B: can reduce by 4 days (5 -> 1)
- C: cannot reduce (2 -> 2)

- F: can reduce 2 days (5 -> 3)
  Total possible reduction on that path = 1+4+0+2 = **7 days** (>= 6 required) -> Thus this is viable

Crash procedure (minimum incremental cost on the current critical path, recalculating critical path after each step):

1. **Crash A by 1 day** (cheapest on current critical path at $400/day).
   - A: 2 -> 1, extra cost = $400
   - New proj length: 14 -> 13 days
   - New path lengths: A–B–C–F = 13; A–D–F =11; A–E–F = 12
2. **Crash F by 2 days** (2nd cheapest on the critical path at $500/day; F can be shortened by 2)
   - F: 5 -> 3, extra cost = 2*$500 =$1,000
   - New project length: 13 -> 11 days
   - New path length: A–B–C–F =11; A–D–F = 9; A–E–F = 10
3. **Remaining reduction we require:** 11 -> 8 = **3 days**.
   - On current critical path A–B–C–F, only B can still be crashed (C cannot) B's crash cost = $750/day
   - Crash **B by 3 days**: B: 5 -> 2, extra cost = 3 * $750 =$2,250
   - After this: A–B–C–F = 1 + 2 + 2 + 3 = **8 days** -> target reached.

I didn't crash D or E because they re not on the critical path and crashing them would not reduce the proj duration until crit path changed, my chosen sequence minimizes incremental cost at each step

Activities shortened: A by 1 day, F by 2 days, B by 3 days

(d) Total proj cost when completed in 8 days

Start from normal cost $10,950 (from (a)). Add incremental crash costs:

- A: +$400(1day)->Acostbecomes$1,600 (which equals given crash cost)
- F: +$1,000(2days)->Fcostbecomes$3,000 (full crash cost)
- B: +$2,250(3days)->Bcostbecomes$1,500 + $2,250 =$3,750

Sum extra crash cost = $400+$1,000 + $2,250 =$3,650

Total project cost = normal cost + crash increments = $10,950+$3,650 = **$14,600**

Ans (d): $14,600

Q2:

Given

- Planned Value (PV) = $28,000
- Earned Value (EV) = $25,000
- Actual Cost (AC) = $29,500

(a) Budget status - Over or under budget?

Cost Variance (CV) = EV − AC = $25,000 - $29,500 = **−$4,500** - negative CV means **over budget** to date

Cost Performance Index (CPI) = EV / AC = 25,000 / 29,500 = **0.8475** (~= **0.85**)
CPI < 1 => you are getting $0.85 value for every$1 spent - **cost efficiency is poor**

Interpretation: the phase is currently **over budget** by $4,500 and performing at ~85% cost efficiency - spending must go down!

(b) Schedule status - On time or behind?

Schedule Variance (SV) = EV − PV = $25,000 - $28,000 = **−$3,000** - negative SV means **behind schedule** (in value terms)

Schedule Performance Index (SPI) = EV / PV = 25,000 / 28,000 = **0.8929** (~= **0.89**)
SPI < 1 ==> about **89%** of planned work value has been earned -> **behind schedule**

Interpretation: the phase is **behind schedule** (shortfall $3,000 in earned value)

(c) Quick forecast (optional) - estimate to complete the phase

You need the **Budget at Completion (BAC)** to make a formal EAC. If the phase BAC = the planned value to date (PV = $28,000) then:

One common EAC formula:
EAC = BAC / CPI ==> EAC ~= 28,000 / 0.8475 ~= **$33,050**

Alternate form: **EAC = AC + (BAC − EV)/CPI** ==> 29,500 + (28,000−25,000)/0.8475 ~= 29,500 + 3,539 ~= **$33,039** (same within rounding)

Implication: if trends continue & BAC = $28k, expectedfinalcost = **$33k** - **~$5k over original BAC**

(If BAC =/= PV, substitute actual BAC into the same formulas.)

(d) Actionable implications (brief)

- **Over budget** and **behind schedule** - both warning signs
- Performance indices CPI ~= 0.85 and SPI ~= 0.89 indicate corrective action needed (cost control, scope/replanning, re-allocation of resources, staff changes, etc etc)
- Produce an **EAC** using the true BAC, re-evaluate remaining work, and prepare a remedial plan (cost reductions, replanning, prioritized or narrow er scope)
- Re assess assumptions, risks, and approvals (license/gaming items may be driving rework/costs).

Common formulas for Q 34567

- **SV (Schedule Variance)** = EV − PV
- **CV (Cost Variance)** = EV − AC
- **SPI (Schedule Performance Index)** = EV / PV
- **CPI (Cost Performance Index)** = EV / AC

Q3:

PV = $190,000, EV =$150,000, AC = $170,000

(a)
SV = EV − PV = $150,000 - $190,000 = **−**$40,000 * * CV = EV - AC =$**150,000 −** $170,000 =$
$* * -$**20,000**

(b) Conclusion:

- **Behind schedule** (SV < 0)
- **Over budget / cost overrun** (CV < 0).

Q4:

//(same values) PV = $190,000, EV =$150,000, AC = $170,000

(a)
SPI = EV / PV = 150,000 / 190,000 = **0.7895** (rounded)

(b)
CPI = EV / AC = 150,000 / 170,000 = **0.8824** (rounded)

(c) Conclusion:

- **SPI < 1 (0.7895)** - project is **behind schedule** (only ~78.95% of planned work earned)
- **CPI < 1 (0.8824)** - proj is **cost-inefficient / over budget** (you get ~=$0.88 value per$1 spent)

Q5

PV = $140,000, EV =$160,000, AC = $145,000

(a)
SV = EV − PV = $160,000 -$140,000 = **+$20,000**

(b)
CV = EV − AC = $160,000 -$145,000 = **+$15,000**

(c) Conclusion:

- **Ahead of schedule** (SV > 0)
- **Under budget / cost favorable** (CV > 0)

Q6

(same values) PV = $140,000, EV =$160,000, AC = $145,000

(a)
SPI = EV / PV = 160,000 / 140,000 = **1.1429** (rounded)

(b)
CPI = EV / AC = 160,000 / 145,000 = **1.1034** (rounded)

(c) Conclusion:

- **SPI > 1 (1.1429)** - project is **ahead of schedule**
- **CPI > 1 (1.1034)** - project is **cost-efficient / under budget** (~=$1.10 value per $1 spent)

Q7

PV = $240,000, EV =$250,000, AC = $270,000

(a)
SV = EV − PV = $250,000 − $240,000 = **+$10,000**.

(b)
CV = EV − AC = $250,000 − $270,000 = **−$20,000**.

(c)
SPI = EV / PV = 250,000 / 240,000 = **1.0417** (rounded).

(d)
CPI = EV / AC = 250,000 / 270,000 = **0.9259** (rounded).

(e) Conclusion:

- **Ahead of schedule** (SPI > 1, SV > 0).
- **Over budget / cost-inefficient** (CPI < 1, CV < 0): the project is progressing faster than planned but spending is way too high - higher than the value earned