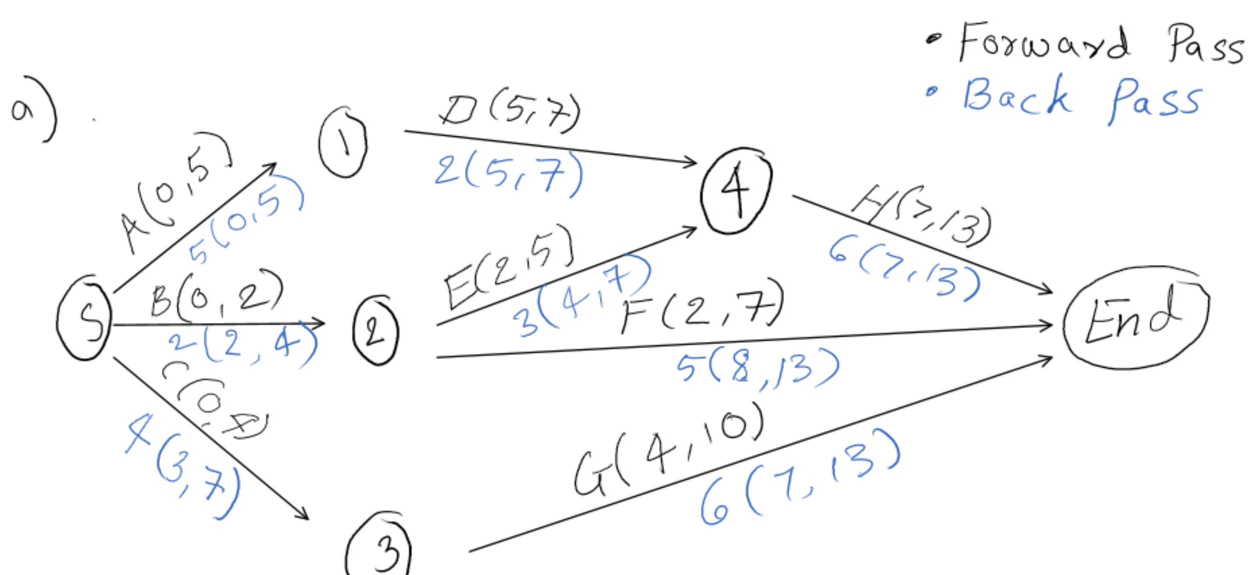
Please answer one question 0-9 depending on your student <u>ID's last (end) digit</u>
Problem 1. **(Please answer only one problem with 5 parts (a-e) below based on your last digit on your UML ID). Use Charts next page as the source of data for the one problem you are answering**

Total = 6 points, part a = 2 points; parts b, c, d, and e 1 point each

a. Draw PERT Chart with earliest and latest start and finish times/activity. Fill in the slack time in the table for each activity. Show the slack time for each path for all paths and show Critical Path (CP) and CP time.
b. For the project duration, show the staffing profile, beginning at the earliest time (forward pass) +Totals +Max Delta
c. For the project duration, show the staffing profile, beginning at the latest time (backward pass) +Totals+ Max Delta
d. Suggest moving only one activity only to best level staffing requirements (from either Fwd or Bkd Pass). Make sure to give the total staffing required and maximum (delta) reduction in staffing for the duration of the project.
e. Which **one** activity only is best to crash to shorten project time in how many weeks (in some cases two activities might be required to crash)? Show the results and the new Critical Path(s) if you crash the one activity

See next page – use one table only that matches your UML ID last digit.

ID 2 Activity	Start Node	End Node	Activity Time	Staff Required	Crashing Cost
A	S	1	5	3	500
B	S	2	2	2	700
C	S	3	4	3	900
D	1	4	2	3	1000
E	2	4	3	3	500
F	2	End	5	3	900
G	3	End	6	5	1000
H	4	End	6	2	1200



Critical Path Time: 13 weeks, Critical Path: S-1-4-End

Activity/Week	Start Node	End Node	Activity Time	Slack Time
A	S	1	5	0
B	S	2	2	2
C	S	3	4	3
D	1	4	2	0
E	2	5	3	1
F	2	End	5	6
G	3	End	6	3
H	4	End	6	0

	Possible Path	Time	Slack
Possible Path 1:	S-1-4-End	13	0
Possible Path 2:	S-2-4-End	11	2
Possible Path 3:	S-2-End	7	6
Possible Path 4:	S-3-End	10	3

Critical Path: S-1-4-End

b)

Activity/Week	1	2	3	4	5	6	7	8	9	10	11	12	13	
A	3	3	3	3	3									
B	2	2												
C	3	3	3	3										
D						3	3							
E			3	3	3									
F			3	3	3	3	3							
G					5	5	5	5	5	5				
H								2	2	2	2	2	2	Total
Total	8	8	12	12	14	11	11	7	7	7	2	2	2	103

Max Delta: 14 - 2 = 12

c)

Activity/Week	1	2	3	4	5	6	7	8	9	10	11	12	13	
A	3	3	3	3	3									
B			2	2										
C				3	3	3	3							
D						3	3							
E					3	3	3							
F									3	3	3	3	3	
G								5	5	5	5	5	5	
H								2	2	2	2	2	2	Total
Total	3	3	5	8	9	9	9	7	10	10	10	10	10	103

Max Delta: 10 - 3 = 7

d) By shifting C left by 3 weeks (or units), best staffing requirement can be achieved.

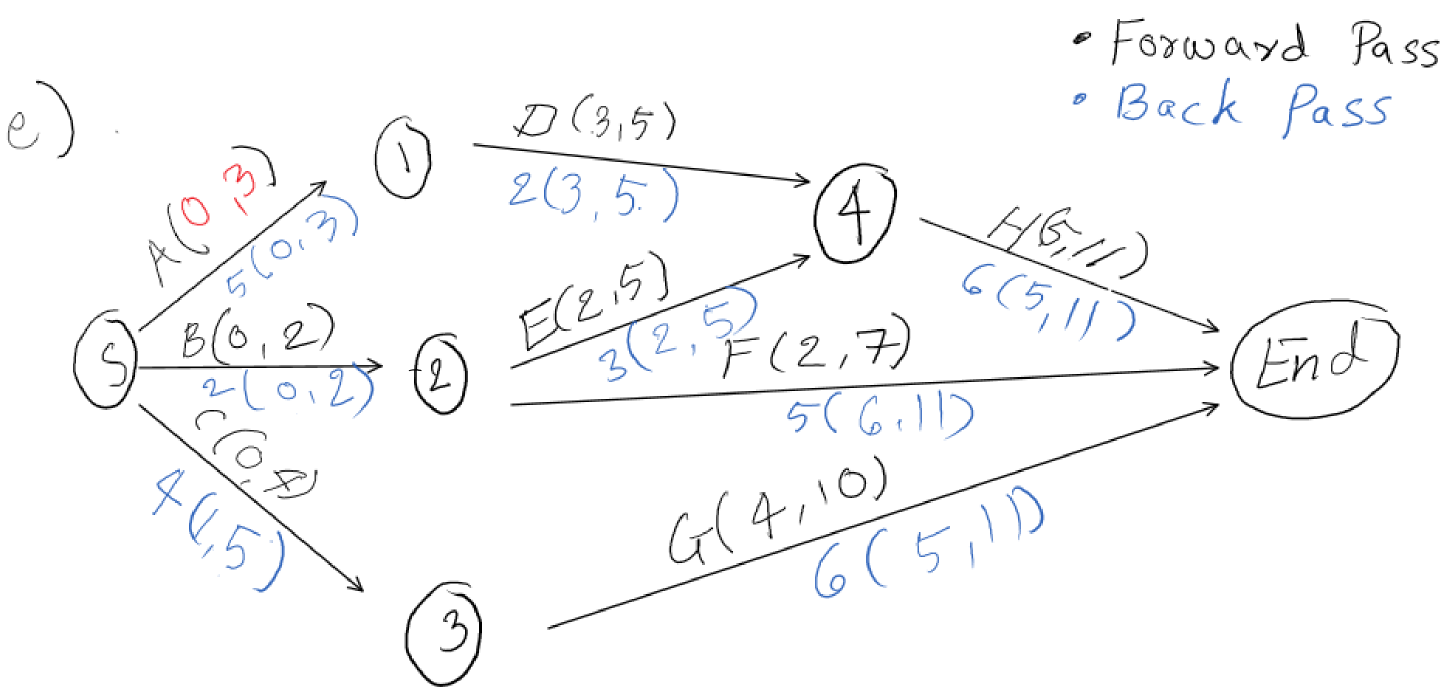
Activity/Week	1	2	3	4	5	6	7	8	9	10	11	12	13	
A	3	3	3	3	3									
B			2	2										
C	3	3	3	3										
D						3	3							
E					3	3	3							
F									3	3	3	3	3	
G								5	5	5	5	5	5	
H								2	2	2	2	2	2	Total
Total	6	6	8	8	6	6	6	7	10	10	10	10	10	103

Max Delta: 10 - 6 = 4

e) By crashing A by 2 weeks, we reduce the total time to 11 weeks, and we also get 2 critical paths.

Crashing A would cost $500/week = total $1000.

Critical Paths: **S-1-4-End, S-2-4-End**



Please answer one question 0-9 depending on your student <u>ID's last (end) digit</u>

Problem 2. **(Please answer only one problem with 3 parts (a-c) below based on your last digit on your UML ID). Use Charts next page as the source of data for the one problem you are answering UML ID).**

Total = 6 points, part a = 3 points; parts b = 2 points and part c 1 point.

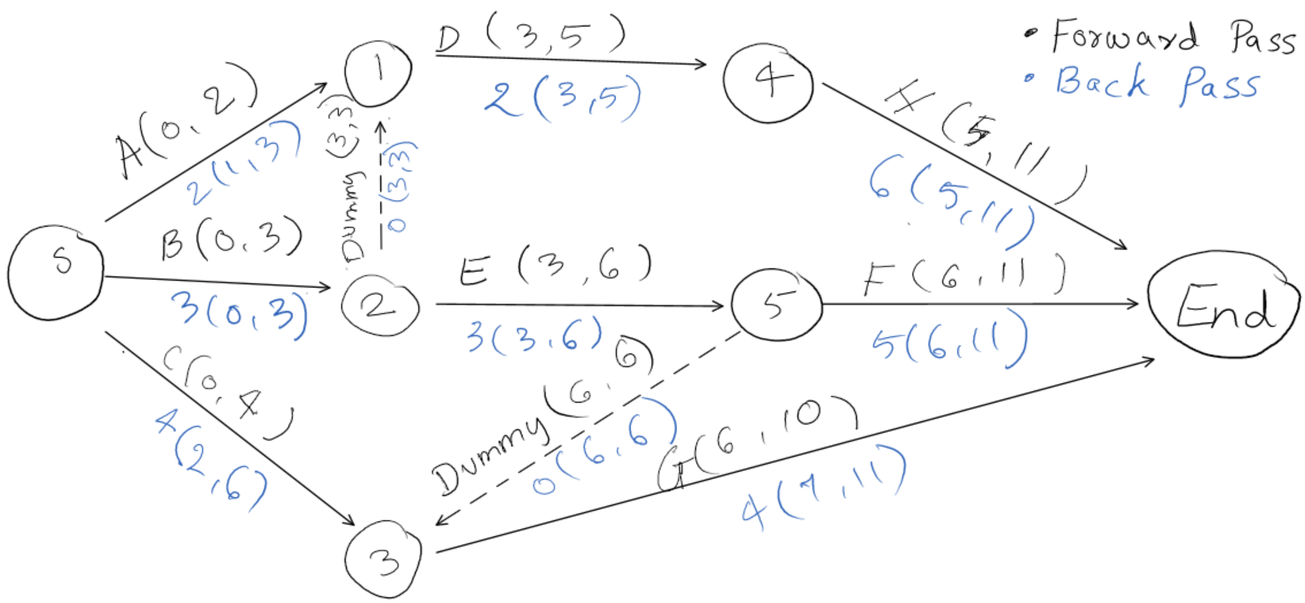
Consider the following project. Use activity times as the most likely time for determining the critical path. Use the optimistic and pessimistic times (together with activity times) to determine expected completion time limits

a. Draw PERT Chart with earliest and latest start and finish times/activity. Fill in the slack time in the table for each activity. Show the slack time for each path for all paths and show Critical Path (CPM) and CPM time.
b. What is the expected time for 68, 95 and 99 per cent Confidence Interval (CI) for the project?
c. Show the (ID 0=55%, ID1=60%, ID 2=70%, ID 3=80%, ID 4=85%, ID 5=50%, ID 6=65%, ID 7=75%, 8=99.5%, ID 9=97.5%), Confidence Interval for the project (use section 7.4.3. page 225 for parts 2/3) for only one percentage corresponding to your ID, not all percentages.

See next page – use one table only that matches your UML ID last digit.

ID 2 Activity	Preceding Activity	Start Node	End Node	Activity Time	Staff Required	Optimistic Time	Pessimistic Time
A	--	S	1	2	4	1	3
B	--	S	2	3	2	2	4
C	--	S	3	4	3	1	2
D	A, B	1	4	2	5	1	4
E	B	2	5	3	7	1	5
F	E	5	End	5	3	1	4
G	C, E	3	End	4	5	1	7
H	D	4	End	6	2	1	4

a)



Critical Path: <u>S-2-1-4-End</u> and <u>S-2-5-End</u>.

Here we will consider **S-2-1-4-End**

Activity/Week	Start Node	End Node	Activity Time	Slack Time
A	S	1	2	1
B	S	2	3	0
C	S	3	4	2
D	1	4	2	0
E	2	5	3	0
F	5	End	5	0
G	3	End	4	1
H	4	End	6	0

Path 1: S-1-4-END; time = 10; slack: 11-10 = 1
Path 2: S-2-5-END; time = 11; slack: 11-11 = 0
Path 3: S-3-END; time = 8; slack: 11-8 = 3
Path 4: S-2-1-4-END; time = 11; slack: 11-11 = 0
Path 5: S-2-5-3-END; time = 10; slack: 11-10 = 1

b) Total Project time = 11 weeks = critical path time.

$$\sigma_{activity} = \frac{Pessimistic - Optimistic}{6}$$

B, D, H → critical path.

$$\left.\begin{aligned} \sigma_B &= \frac{4-2}{6} = 1/3 \\ \sigma_D &= \frac{4-1}{6} = 1/2 \\ \sigma_H &= \frac{4-1}{6} = 1/2 \end{aligned}\right]$$

$$\sigma_{proj} = \sqrt{\sigma_B^2 + \sigma_D^2 + \sigma_H^2}$$

$$= \sqrt{\frac{1}{9} + \frac{1}{4} + \frac{1}{4}}$$

$$= \sqrt{11/18} = 0.78$$

i) 68% confidence limit (CI) = 11 ± $\sigma_{project}$
= 11 ± 0.78

⇒ 11.78 → max pessimistic
10.22 → min optimistic

ii) 95% confidence limit = 11 ± 2 * $\sigma_{project}$
= 11 ± 1.56

⇒ 12.56 → max pessimistic
9.44 → min optimistic

iii) 99% confidence limit = 11 ± 3 * $\sigma_{project}$
= 11 ± 2.34

⇒ 13.34 → max pessimistic
8.66 → min optimistic

c) ID = 2 = 70%
for 70% confidence, $f(z) = \frac{1-0.7}{2} = \frac{0.3}{2} = 0.15$
for f(z) = 0.15 → z = −1.03 (approx.)
for 70% confidence = 11 ± 1.03 * $\sigma_{project}$
= 11 ± 0.8034
⇒ 11.803 → max pessimistic
10.197 → min optimistic

Problem 3. Chapter 6. **(Please answer only one question depending on the last digit on your UML ID). Limit your answer to brief and concise sentences. Please list your answers as 1, 2, 3 or 4 as asked for**
2. Discuss two opportunities for outsourcing based on the competency versus dependency Matrix

1. **The task's strategic relevance:** Examine the task's strategic value to your company. Is it essential to the competitive advantage of your business? Is that aspect of your company's distinctiveness? Does it significantly influence your client's decision to choose your goods or services over those of your rivals?
2. **The effect of the assignment on your operational effectiveness:** Determine the significance of this work to the daily operations of your business. If it's done incorrectly or not at all, would your activities "grind to a halt"?

Problem 4. Chapter 6. **(Please answer only one question depending on the last digit on your UML ID). Limit your answer to brief and concise sentences. Please list your answers as 1, 2 or 3 as asked for**
2. Discuss **three** outsourcing quality issues and quality management

1. **Reducing international shipping expenses:** We may locate suppliers closer to your clients to prevent this problem and change in international shipping. To save expenses, you must speak with your supplier and find a different approach.
2. **Maintaining pace with quick pursuers:** Like inflation, this issue arises when demand rises steadily over time. Unfortunately, your only options are to negotiate a price reduction with your present supplier or develop a new outsourcing plan.
3. **Optimization across many product lines:** To save costs, keep using your present supply chain. Determine which product's supply chain is superior.

Problem 5. Chapter 8. **(Please answer only one question depending on the last digit on your UML ID).**
2. Discuss a front-loaded phase review plan, including phases and gates

1. **The Phase gate** is a project management technique that reviews the end of the phase of a project.
2. The principle of a front-loaded phase is that high-containment capital projects require earlier design decisions on more facility details than most of the other types of project phases.
3. The quality of front-loaded planning can be improved using the Project Definition Rating Index.
4. Front-end Loading has 3 phases and 4 gates
    a. Concept Phase. (Decision Gate)
    b. Feasibility Phase. (Decision Gate)
    c. Definition Phase. (Decision Gate) (Authorization Gate)
5. **Decision gate** is a process of project definition based on a planned and standard evaluation at the end of each phase. It helps in bringing key resources into early phases and avoiding breaks at phase transitions
6. The gate control plan allows the organization to validate whether the planning is good enough to face the next phase and limits the project's risk

Problem 6. Chapter 8. **(Please answer only one question depending on the last digit on your UML ID).**
2. Discuss the use of RPN (Risk priority number) in the Risk Register

1. **Risk Priority Number** is a numeric assessment of risk assigned to a process**;** it is a product of:
    a. **Severity (S) -** how bad is the risk
    b. **Occurrence (O)** – Probability of its occurrence
    c. **Detection (D) –** Ways to identify the risk
2. According to the 80:20 rule, the action is prioritized. It thus makes it easier to provide more priority to the issues that require it (selection of critical tasks first)
3. By computing fictitious RPNs for various scenarios, an organization may compare and foresee the consequences of suggested modifications as it works to enhance a process.
4. We must keep in mind that the RPN is simply a tool for assessing risk inside a single process; it cannot be used to compare risk across processes or businesses.

7. Chapter 8/12. **(Please answer only one question depending on the last digit on your UML ID). Please list your answers as 1, 2, 3, 4 or 5 as asked for**
2. Discuss **Five** conflict resolution Strategies by team members and which ones you recommend

1. **Avoidance.** The battle will not be engaged in by any/all the participants. This results in a side losing their technical expertise, which they could have used to influence how the issue is resolved. Conflicts are rarely resolved using this tactic, which also generates resentment.
2. **Competition.** In this tactic, one side tries to pressure the other into making a favorable decision at their expense. In most cases, there is no room for compromise, and instead, everyone digs in their heels and works to intimidate and dominate the opposing group. Competition is a win-or-lose scenario that frequently causes friction within the team.
3. **Accommodation or Cooperation.** In this approach, one or both sides prioritize team relationships over individual objectives. This tactic runs the risk of cutting short the normal negotiating process in favor of preserving team dynamics. This could lead to the team making the incorrect choice to ease stress.
4. **Compromise.** This tactic resembles accommodation. Each participant makes a small concession, which results in a settlement that may not be the right one because everyone made concessions to strike a balance between team and individual aspirations.
5. **Collaboration.** This would be the perfect blend of simultaneously achieving personal goals while maintaining good team relationships. In this strategy, original goals could be reexamined, and the parties renegotiate the goals to achieve common ground and balanced decisions. This strategy creates a win/win situation where everyone will be satisfied with the decision made.

Compromise and **Collaboration** are my personal preferences above all other techniques because I believe that strong team spirit is always preferable to unhealthy competitiveness or resentments brought on by other strategies.

8. Chapter 11. **(Please answer only one question depending on the last digit on your UML ID). Please list your answers as 1, 2, and 3 as asked for.**
Some of the answers are not provided in the textbook and require additional web searches.
2. Suggest **three** possible cost drivers for the **plastics industry** and why you recommend their use

1. **New Market Entry:** Regarding the entry of a new firm, we can state that there aren't many obstacles in the plastics market. This is a result of the fact that plastics businesses demand a lot of cash to start started and operate in the market. As a result, it discourages new competitors from entering the market due to a lack of resources.
2. **Bargaining power of suppliers:** Because there are so many different types of raw materials required for the manufacturing of plastics, suppliers' negotiating leverage is extremely limited in the plastics business. As a result, we have access to a wide range of providers, and no one supplier has more bargaining power than the others.
3. **Component Design:** Effective part design significantly lowers the cost of plastic molding. Design, however, takes time. You are investing in the achievement of your product. A part will be developed with the final use case, materials, transport, client budget, production volume, tooling production, and manufacturing running costs in mind from the outset to be as efficient as possible.

References

General Reference:

- *Engineering Project Management for the Global High-Technology Industry, Sammy Shina, Ph. D, P.E.*
- *Personal experience of the author*

Question-related references:

- Problem 3:
  https://www.mindtools.com/pages/article/newSTR_45.htm
- Problem 6:
  http://www.ihi.org/resources/Pages/Measures/RiskPriorityNumberfromFailureModesandEffectsAnalysis.aspx
- Problem 7:
  https://dienamics.com.au/blog/3-main-cost-drivers-injection-moulding/