odd 1 → 2nd question.

EPM MECH 5760 **Odd** 7th Digit Final Exam Your Last UML Digit: **01983092** Name: **Kartik Patath**

Please answer one question 0-9 depending on your student ID last (end) digit

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**

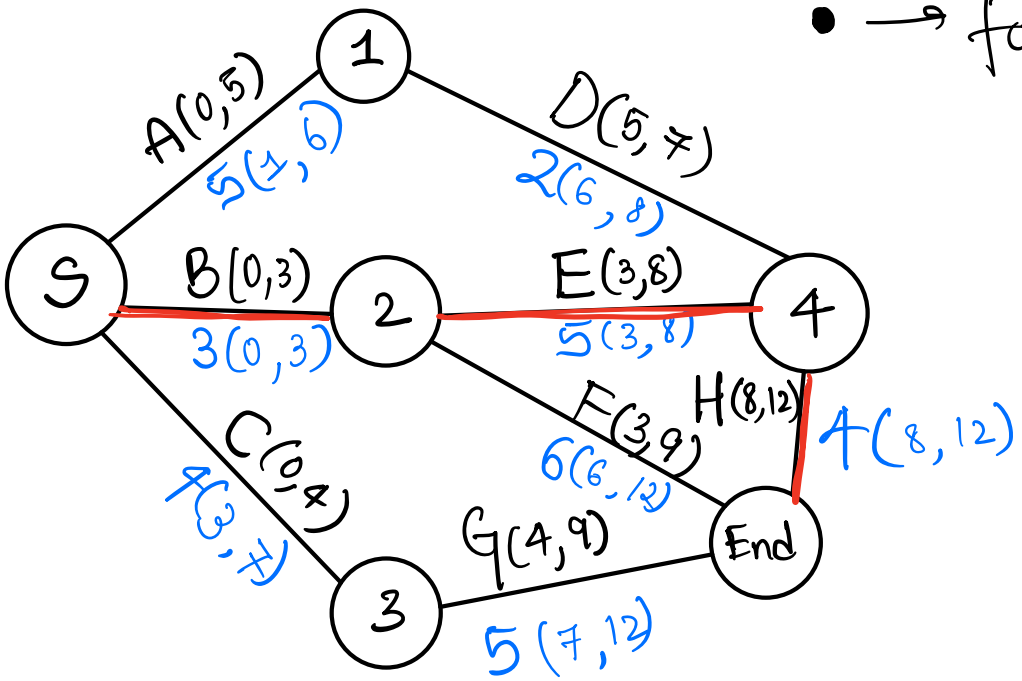
Total = 6 points, part a = 2 points; parts b, c, d, and e 1 point each

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 staffing profile, beginning at the earliest time (forward pass) +Totals +Max Delta
c. For the project duration, show 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 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	3	2	700
C	S	3	4	3	900
D	1	4	2	3	1000
E	2	4	5	3	500
F	2	End	6	3	900
G	3	End	5	5	1000
H	4	End	4	2	600

● → Backpass
● → forward.



a)

Critical Path: S-2-4-E

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

Path 1: S-1-4-E, time = 11, Slack = 1
Path 2: S-2-4-E, time = 12, Slack = 0
Path 3: S-2-E, time = 9, Slack = 3
Path 4: S-3-E, time = 9, Slack = 3

b) Earliest

Activity/Week	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	
A	3	3	3	3	3									
[B]	2	2	2											
C	3	3	3	3										
D						3	3							
[E]				3	3	3	3	3						
F				3	3	3	3	3	3					
G					5	5	5	5	5					
[H]									2	2	2	2		**Total**
Total	8	8	8	12	14	14	14	11	10	2	2	2		105

Max Delta = 14 − 2 = 12

c) Latest

Activity/Week	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	
A		3	3	3	3	3								
B	2	2	2											
C				3	3	3	3							
D							3	3						
E				3	3	3	3	3						
F							3	3	3	3	3	3		
G								5	5	5	5	5		
H									2	2	2	2		**Total**
Total	2	5	5	9	9	9	12	14	10	10	10	10		105

Max Delta = 14 − 2 = 12

d) We can achieve best staffing requirement by shifting "A" by 1 unit to left

Activity/Week	1	2	3	4	5	6	7	8	9	10	11	12	13	
A	3	3	3	3	3									
B	2	2	2											
C				3	3	3	3							
D							3	3						
E				3	3	3	3	3						
F							3	3	3	3	3	3		
G								5	5	5	5	5		
H									2	2	2	2		Total
Total	5	5	5	9	9	6	12	14	10	10	10	10		105

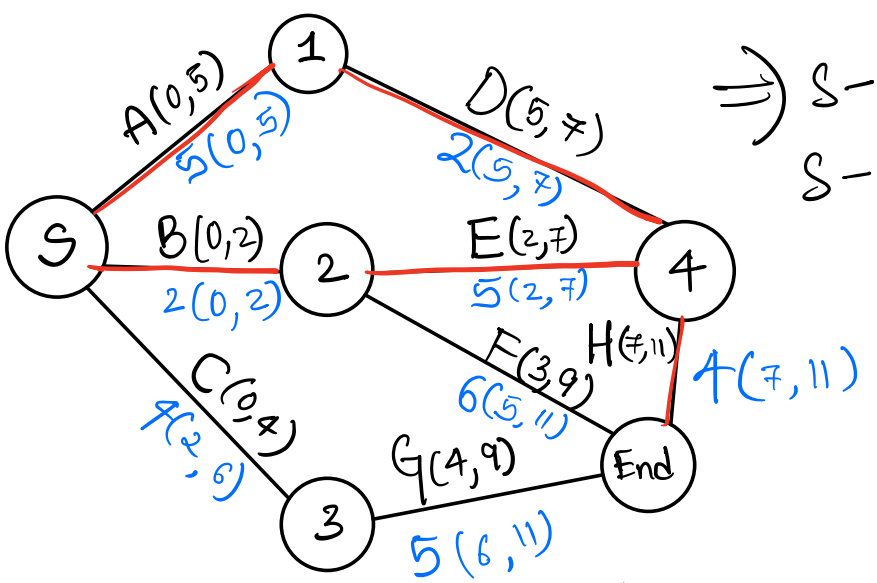
Max Delta = 14 − 5 = 9

e) By Crashing "B" by 1 week, you reduce the total time to 11 weeks & we also get 2 Critical paths

Critecal paths

⇒ S − 1 − 4 − End

S − 2 − 4 − End



Crashing B would cost $700

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Please answer one question 0-9 depending on your student <u>ID 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).**

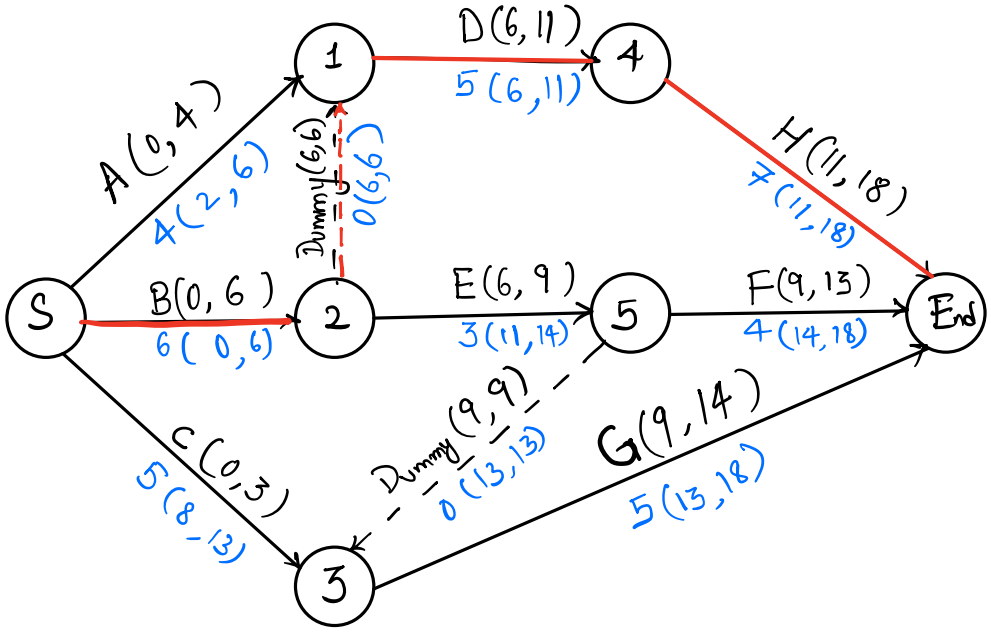
Total = 6 points, part a = 3 points; parts b = 2 points and part c 1 point.

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 percent 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)

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

ID 2 Activity	Preceeding Activity	Start Node	End Node	Activity Time	Staff Required	Optimistic Time	Pessimistic Time
A	---	S	1	4	4	3	5
B	---	S	2	6	6	4	10
C	---	S	3	3	5	2	4
D	A, B	1	4	2	5	1	3
E	B	2	5	3	7	2	4
F	E	5	End	4	3	2	6
G	C, E	3	End	5	5	3	7
H	D	4	End	7	2	5	9



Critical Path :- S-2-1-4-End.

Activity	Start Node	End Node	Activity Time	Slack Time
A	S	1	4	2
✓ B	S	2	6	0
C	S	3	3	8
✓ D	1	4	2	0
E	2	5	3	5
F	5	End	4	5
G	3	End	5	4
✓ H	4	End	7	0

Path 1: S – 1 – 4 – End ; time = 16 ; Slack = 2

Path 2: S – 2 – 5 – End ; time = 13 ; Slack = 5

Path 3: S – 3 – End ; time = 10 ; Slack = 8

Path 4: S – 2 – 1 – 4 – End ; time = 18 ; Slack = 0

Path 5: S – 2 – 5 – 3 – End ; time = 14 ; Slack = 4

b) Total Project time = 18 Weeks = Critical Path time.

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

B, D, H → Critical path.

$$\sigma_B = \frac{10-4}{6} = 1$$

$$\sigma_D = \frac{3-1}{6} = \frac{1}{3}$$

$$\sigma_H = \frac{9-5}{6} = \frac{2}{3}$$

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

$$= \sqrt{1 + \frac{1}{9} + \frac{4}{9}} = \sqrt{\frac{14}{9}}$$

$$= 1.2472$$

i) 68% Confidence limit (CI) $= 15 \pm \sigma_{Project}$

$= 15 \pm 1.2472$

$\Rightarrow$ 16.2472 → max Pessimistic for 68% CI

13.7528 → min Optimistic

ii) 95% Confidence limit $= 15 \pm 2 * \sigma_{project}$

$= 15 \pm 2.4944$

$\Rightarrow$ 17.4944 → max Pessimistic for 95% CI

12.5056 → min Optimistic

iii) 99% Confidence limit $= 15 \pm 3 * \sigma_{Project}$

$= 15 \pm 3.7416$

$\Rightarrow$ 18.7416 → max Pessimistic for 99% CI

11.2584 → min Optimistic

c) ID = 2 = 70%.

for 70% Confidence $f(z) = \frac{1-0.7}{2} = \frac{0.3}{2} = 0.15$

for $f(z) = 0.15 \longrightarrow Z = -1.03$ (app.)

for 70% Confidence $= 15 \pm 1.03(\sigma_{Project})$

$= 15 \pm 1.284616$

$= 16.284616 / 13.715384$

max ← 16.284616 / 13.715384 → min

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Problem 3. Chapter 6. **(Please answer only one question depending on your 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 strategic importance of the task**. Analyze the task's strategic importance to your business. Is it vital to your company's competitive advantage? Is it part of what makes your business unique? Does it play a major part in your customers' choice of your products or services over those of your competitors?
2. **The task's impact on your operational performance.** Decide how important this task is to your company's day-to-day running. Will your operations "grind to a halt" if it's done badly, or not done at all?

Problem 4. Chapter 6. **(Please answer only one question depending on your 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. **Mitigating International delivery costs.** To avoid this issue, we can find suppliers nearer to your customers to avoid international delivery change. You need to contact your supplier and find another yaw to cut costs.
2. **Keeping up with fast followers.** This is a problem similar to inflation, in the context of increasing demand in successively. Unfortunately, there is no other way except to reduce the cost with your current supplier or pursue a new outsourcing strategy
3. **Multiple product line optimization.** Stick with your current supply chain to optimize cost. Find the best supply chain for each product

Problem 5. Chapter 8. **(Please answer only one question depending on your 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 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 by the use of 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 your 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. The action is prioritized based on 80:20 rule. Which in turn helps to prioritize the things which need more attention (selection of critical tasks first)
3. As an organization works to improve a process, it can anticipate and compare the effects of proposed changes by calculating hypothetical RPNs of different scenarios.
4. We need to remember that the RPN is a measure for comparison within one process only; it is not a measure for comparing risk between processes or organizations.

7. Chapter 8/12. **(Please answer only one question depending on your 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 do you recommend

1. **Avoidance**. One/All the parties involved in the conflict will avoid the conflict. This leads to loss of technical competence that a party can use to influence the problem resolution. This strategy rarely solves conflict and leads to resentments.
2. **Competition**. In this strategy, one party attempts to force a favorable decision at the expense of the other party. Usually there is no compromise, and everyone digs in their heels and tries to overpower the other party with arguments and intimidation. Competition is a win/lose situation that often results in antagonism within the team.
3. **Accommodation or Cooperation**. In this strategy, one or both parties place a greater emphasis on team relationship over personal goals. The danger of this strategy is that the proper negotiation process is aborted in favor of maintaining team relationships. This could possibly result in the wrong decision being made for the sake of reducing tension in the team.
4. **Compromise**. This strategy is similar to accommodation. Each party gives up a little, with a resulting resolution that can be the wrong one, due to compromising by all parties to balance team and personal goals.
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 decision. This strategy creates a win/win situation where everyone will be satisfied with the decision made.

I personally prefer **Compromise** and **Collaboration** over any other strategy because it is always good to have a healthy spirit in the team rather than toxic competition or resentments caused due to the other strategies.

8. Chapter 11. **(Please answer only one question depending on your last digit on your UML ID). Please list your answers as 1, 2, 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**: In plastic industry, we can say that there are not many problems available regarding the entry of the new company. This is because of the fact that plastic companies are generally capital intensive and requires a lot of capital to come up in the industry. Thus, it reduces the number of new entrants to enter the market because of lack of resources.

2. **Bargaining power of suppliers** in the plastic industry is considerably low because there are a large number of great varieties of the raw materials that are being needed in the production of the plastics. Thus, we have a large no. of suppliers and variety available and there is no one supplier who can exercise their bargaining power more or less than another.

3. **Part Design:** Good part design reduces the costs of plastic moulding dramatically. However, design takes time. It is an investment you make in the success of your product. For maximum efficiency, a part will be designed with consideration for end use case, materials, transport, client budget, production volume, tooling production and manufacturing running costs from the very beginning.

References

General Reference:

1. **Engineering Project Management for the Global High-Technology Industry, Sammy Shina, Ph. D, P.E.**
2. 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/