ISE515 – Engineering Project Management

Midterm Exam – 150 Points

(Take-Home)

10/11/2022 – 10/30/2022

Fall 2022

Student ID: _____

(DO NOT WRITE YOUR NAME)

INSTRUCTIONS:

1. **Print your Student ID on all pages. DO NOT WRITE YOUR NAME or you will lose 5 points**
2. **Please TYPE the answers. No hand written submittals please!**
3. **This exam is take-home, open book, open notes. However, students may not share notes or documents with each other. "TEAMWORK IS NOT ALLOWED HERE"!**
4. **Do not exceed the number of lines limitation (shown in red), or it will not be read. Do not change font size or spacing. Delete the red lines and use the space.**
5. **Use *italic*, Bold, Underline, CAPS, to highlight important comments, quotations, conclusions, etc.**
6. **YOU WILL NOT EARN ANY POINTS BY ONLY REPEATING THE LECTURES / BOOKS / REFERENCES STATEMENTS. And if you do, make sure to provide proper citation.**
7. **All work must be done on this MS-WORD file, without changing anything (other than typing your answers and adding your graphs and annotations), then convert to [Last 4 digits of Student ID].PDF (e.g. 5473.pdf) no other words, letters, spaces, numbers, or you will lose 5 points) and submit. No other submittals will be graded. Do not submit multiple copies.**
8. **Do not submit any other files (Excel, Word, MSP, etc.), they will not be graded. All work must be included in the [Last 4 digits of Student ID].PDF file, nothing else is needed.**

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(30 points) 1. Select two projects of <u>two different natures</u> (see examples below).

a. **<u>(15 points)</u>** Hypothesize and **<u>draw</u>** the shape of the cumulative cost curve for each project, both together **<u>on one graph</u>**. Identify **<u>a few (3 to 5)</u>** key points on the graph (points of slope change) with **<u>proper</u> <u>annotations on the graph at the key point</u>** explaining the reasons for these changes. In one paragraph (below), explain why the two graphs look different (e.g. S, J, linear, reverse S or J, step, etc.). You can use bold/underline formatting to highlight your key reasons.

One Paragraph, 5 lines max.

b. **<u>(10 points)</u>** Redraw ONE of the curves in a **<u>new graph</u>**, overlaid by your *preferred* **<u>cumulative</u>** cash **<u>in</u>**flows curve (i.e. **<u>how you get paid in time by the client, how the project is being funded</u>**). Provide one paragraph explaining why the cash flows curves differ from the cost curve, identify areas of surplus / deficit cash, and *why you prefer this pattern*, as the PM.

One Paragraph, 5 lines max.

c. **<u>(5 points)</u>** Explain how your lack of discipline as a PM could cause your preferred *funding* schedule (per **bullet b** graph) to backfire on your project cost, or worse, result in unethical decisions.

Tips: 1) Recall "Lean" philosophy, 2) Ethics= a set of moral issues or aspects (such as rightness), Meriam-Webster Dictionary

One Paragraph, 5 lines max.

Example Projects (Pick two projects with significantly different natures, not necessarily from this list):

- Building an airplane
- Internal problem solving project (Six Sigma)
- Develop a new cure for Leukemia
- Writing a new computer game program
- Staging a house for sale
- Launching a house for sale

Note: Your curve should cover the *entire* project life-cycle; initiation → close-out

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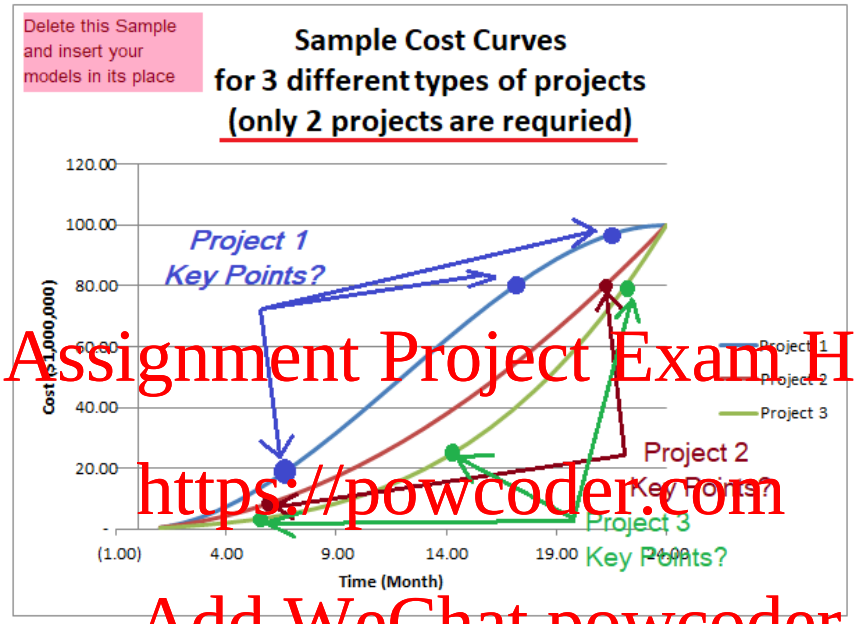
Sample graphs for part a:

Delete everything on this page (except header/footer) and put your graphs. Do not draw your model over this graph. Create your own graph. You can hand-draw (legibly) or create it in Excel and paste the picture here. Use this page, and only this page for both your models (parts a and b). Do not submit any other files

You will lose at least 7 points if you do not follow these instruction



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(30 points) 2. Your textbook (Meredith) repeatedly refers to the tension among the project objectives as "trade-offs":

a. **(10 points)** Are you really doing trade-offs among the three project objectives? Read the **attached handout** and explain whether, *as a professional project manager*, you see this as a "trade-off", a "puzzle", a "dilemma", or "a paradox", and why?[1]

One Paragraph, 5 lines max.

b. **(10 points)** Give ONE specific example (as discussed in the class) explaining how you would use your (traditional) Project Management Plan (project Baselines) to compensate for deviations from one project objective, without compromising the others, i.e. getting "the best of both worlds"! How are your responses to parts (a) and (b) related to each other?

One Paragraph, 5 lines max.

c. **(10 points)** Use your two projects from problem #1 (or two other *dissimilar* projects) as two specific examples to explain how in different projects the primary objectives could have different weights and, in spite of that, you cannot *sacrifice* one objective for the sake of another. Explain the "Genius of And"[2] here; *"one project objective may have more weight, yet the other two shall not be sacrificed/ignored"*, focusing on the big picture (organization), and how the project serves it.

One Paragraph, 5 lines max.

[1] Your response must correspond with the class discussion. If you disagree with what was discussed in the class, you should have voiced your disagreement then, not now.
[2] Jim Collins, Good to Great: https://www.jimcollins.com/concepts/genius-of-the-and.html

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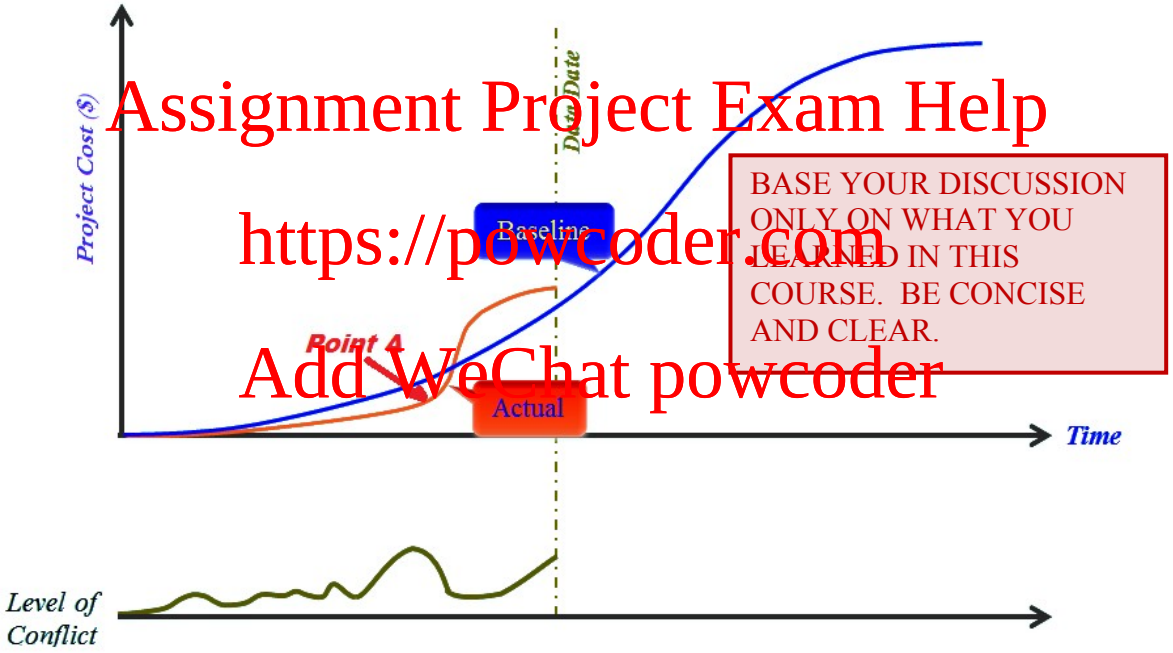
(45 points) 3. Based on the following Life-Cycle S-Curve and internal conflict level, three possible reasons can contribute to the sudden increase in the slope of the *actual progress curve* at point A:

i. The ***Project Manager's (culprit)*** early performance was poor, the Senior Management intervened at point A, resolved the problems and made significant improvements to the process, then gave the project back to the Project Manager to continue running it, when the crisis was over.

ii. The Project Manager was not empowered (supported) properly by the ***Senior Manager (culprit)***. The PM was given the right people, but not the right tools & equipment. She managed to convince the Senior Management to provide *some* resources at point A to improve the progress.

iii. The ***Client (culprit)*** failed to finance the project properly and finally injected *some* money into the project at point (A), when he finally felt the danger.



BASE YOUR DISCUSSION ONLY ON WHAT YOU LEARNED IN THIS COURSE. BE CONCISE AND CLEAR.

a) **(15 points)** In the provide table (Page 7), analyze each case to identify both **"Leadership"** and **"Management"** *possible*[3] problems, based on the actual progress curve and conflict level; what's your diagnosis of the primary culprit's mistake?

NO Paragraph. Fill the table on Page 7 only (without expanding it). Provide clear and specific explanations. e.g.: For Scenaria 1, Leadership: the PM did *such and such (SPECIFIC)* mistakes in leading her team or communicating with the SM / Client

Tip:

Leadership (organic) = Leading, following, empowering, communicating, conflict, collaboration, etc. with **people** (team dynamics)

Management = Efficient and effective use of (Traditional) Project Management **tools and techniques**. ← *For this course*

[3] Use your creativity and hypothesize a *simple and realistic* story behind the scenario

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b) **(30 Points)** For the Scenario #1 above (PM = Culprit):

i. **(10 points)** Explain how you, as the SM, would be able to improve the situation - ***Tip: Change takes time & effort*** ← *You will lose points of you do not use this tip right!*

One Paragraph, 10 lines max.

ii. **(20 points)** Show in the space provided on page 7 & Page 8, **after deleting the current content**, how the Earned Value, the Actual Cost curve and the conflict level curve will look for the rest of the project for two different scenarios:

PROJECT A: Make no changes to the current "fire-fighting" culture

PROJECT B: Make the improvements proposed in part (i) above

Note : Provide clear annotations on the graph at key turning points and clearly show and annotate the end of the curve

No paragraph here. Only show your forecast curves on the graph on page 8 and explain each critical point for each scenario, on the graph, using small sentences

Tip: End of the graph will show how much the project deviated from plan. Budget overrun will be higher on the y-axis and time delay will be more to the left on the x-axis. Make *rational* and *realistic* assumptions. Pay attention to all previous notes and tips before drawing this graph.

Side note: In real life, projects fail due to a combination of these (and other) reasons. For this exercise, for simplicity, we are assuming only one party is at fault (PM, SM, or the client) and all other parties have been performing properly.

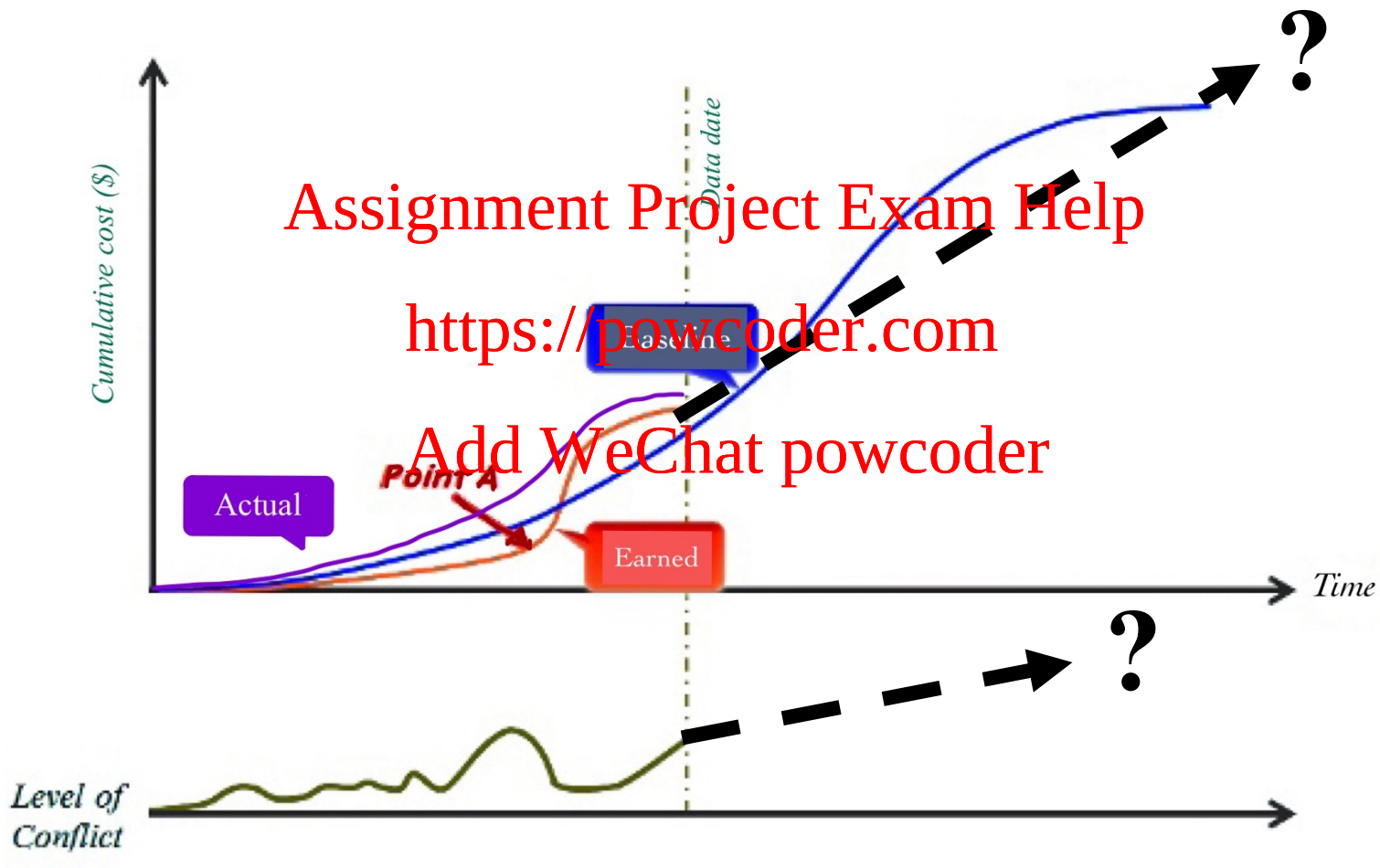
Problem #3 – Continued

NO SMALLER THAN FONT 10, DO NOT CHANGE LINE SPACING. DELTE THE RED TEXT.

Primary Culprit	**Role Scenario**	**Primary Culprit's Leadership flaw**	**Primary Culprit's Management flaw**
P.M.	1. Poor Project Management	**(2.5 Points)**	**(2.5 Points)**
S.M.	2. Weak Empowerment	**(2.5 Points)**	**(2.5 Points)**
Client	3. Weak Financial Support	**(2.5 Points)**	**(2.5 Points)**

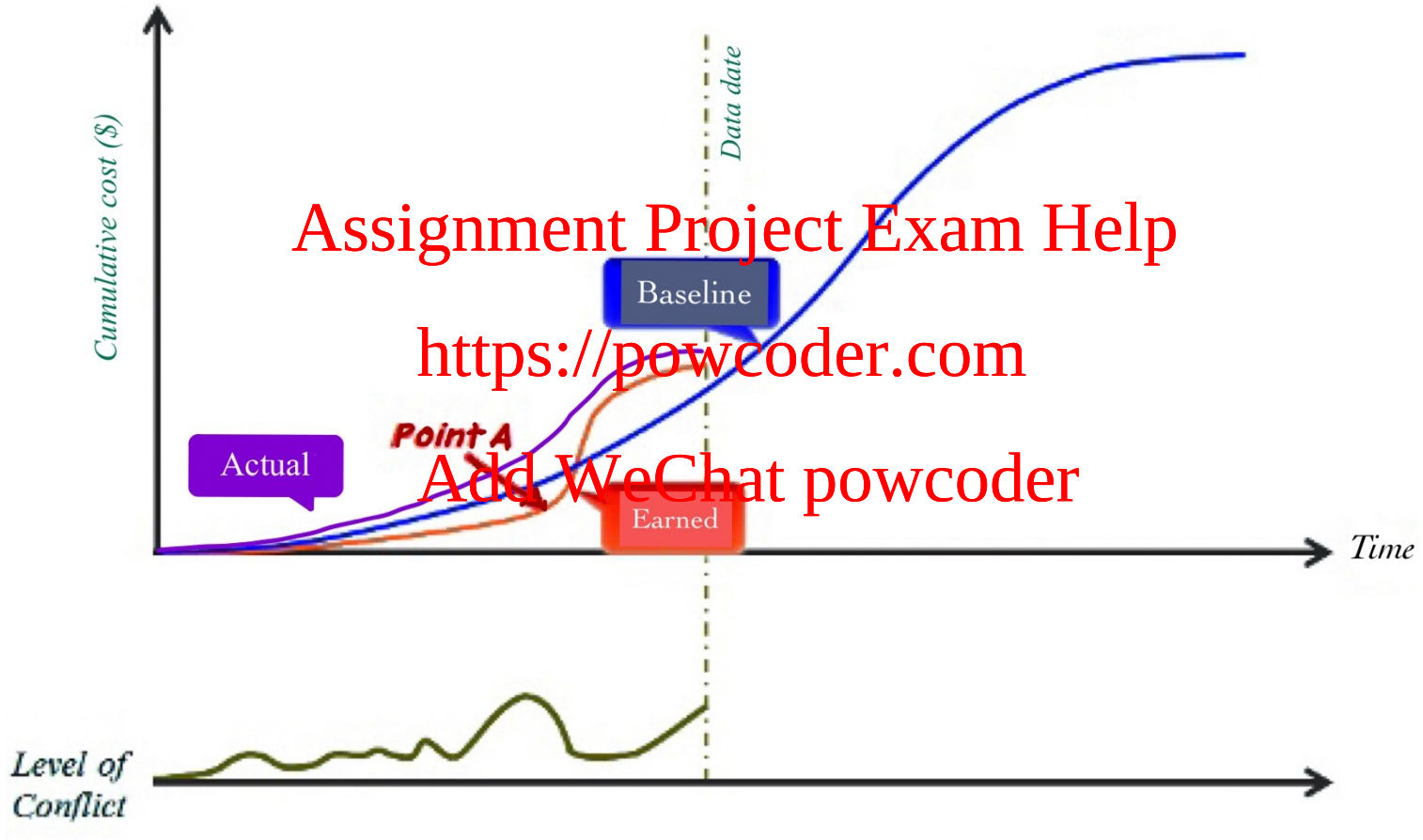
Draw your Graph for part 3.b.ii here. Delete these models and add yours (you can keep the background image and draw over it, but delete the added lines and annotations).

PROJECT A:



Draw your Graph for part 3.b.ii here. Delete these models and add yours (you can keep the background image and draw over it, but delete the added lines and annotations).

PROJECT B:



(20 points) 4. Use a weighted score model to choose between three methods (A, B, C) of financing the acquisition of a major competitor. The relative weights for each criterion are shown in the following table as are the scores for each location on each criterion. A score of 1 represents unfavorable, 2 satisfactory, and 3 favorable.

		Method		
Category	**Weight**	**A**	**B**	**C**
Consulting costs	20	1	2	3
Acquisition time	20	2	3	1
Disruption	10	2	1	3
Cultural differences	10	3	3	2
Skill redundancies	10	2	1	1
Implementation risks	25	1	2	3
Infrastructure	10	2	2	2

a. **(5 points)** Develop a Spreadsheet for Part 4 (a).

Create the table in Excel and copy here its image. Do not submit the Excel file, it will not be reviewed and you will not get credit if your work is not transferred here.

i. **(5 points)** What would your recommendation be if the weight for the implementation risks went down to 10 and the weight of cultural differences went up to 25?

One Paragraph, 3 lines max.

ii. **(5 points)** Suppose instead that method A received a score of 3 for implementation risks. Would your recommendation change under these circumstances?

One Paragraph, 3 lines max.

iii. **(5 points)** The vice president of finance has looked at your original scoring model and feels that tax considerations should be included in the model with a weight of 15. In addition, the VP has scored the methods on tax considerations as follows: method A received a score of 3, method B received a score of 2, and method C received a score of 1. How would this additional information affect your recommendation?

One Paragraph, 3 lines max. _____
_____
_____

5.

(25 points) In the following table, project activities in days are listed with three time estimates for duration in days and predecessors for the activities.

Activity	Optimistic Time	Most Likely Time	Pessimistic Time	Predecessors
a	5	7	12	—
b	8	8	8	—
c	2	6	10	a
d	12	14	19	a, b
e	6	6	12	c, d
f	3	12	18	b, e
g	6	8	10	f

a. **(18 Points, 6 points each))** Calculate the Critical path:
   i. If you are the Naïve Optimist Project Manager (99% of the historical data are worse than your assumed activities' durations).
   Images of the Microsoft Project Barchart ONLY Showing the Critical Path clearly. DO NOT SUBMIT MSP FILE, IT WILL NOT BE GRADED

   ii. If you are the Paranoid Pessimist Project Manager (99% of the historical data are better than your assumed activities' durations).
   Images of the Microsoft Project Barchart ONLY Showing the Critical Path clearly. DO NOT SUBMIT MSP FILE, IT WILL NOT BE GRADED

   iii. If you are a project manager who relies on most his/her most frequent experiences (mode of the historical data on the activities' durations)
   Images of the Microsoft Project Barchart ONLY, Showing the Critical Path clearly. DO NOT SUBMIT MSP FILE, IT WILL NOT BE GRADED

b. **(7 points)** Calculate the *expected* duration and the *expected* Critical Path, assuming activities durations have a PERT distribution with the parameters in the above table?
   Images of the Microsoft Project Barchart, ONLY, Showing the Critical Path clearly (include total duration as a text box). DO NOT SUBMIT MSP FILE, IT WILL NOT BE GRADED

c. **(BONUS 15 points)**[4] provide the algorithm to calculate the probably of the expected Critical path (from part (b)) to be the actual Critical path of the project, using Monte Carlo Simulation in Excel.
   Tip: Excel does not have PERT distribution. The algorithm use Beta distribution function in excel and convert it to PERT distribution using the conversion equations: https://www.vosesoftware.com/riskwiki/PERTdistribution.php

   Either Bulletized algorithm or Flow Chart diagram are acceptable

[4] Extra Credit, applied to the overall exam (this exam only). No partial Credit.