**MBA 647**

**Assignment 3 (Given: April 8, 2024, Due Date: April 16, 2024, on Dropbox)**

**SUBMISSION GUIDELINES**

**General Guidelines:**

* Every group should have a team coordinator, who is responsible for submitting the formatted copy of the files in the dropbox (on course website).
* Every submission should be composed of exactly two files: (1) word file (.doc) or a .pdf file describing the procedures/solutions and (2) an excel file with all the calculations and details.
* Also highlighting the final answers (wherever applicable).
* State your assumptions very clearly.
* Show sample calculations wherever necessary.
* No email submissions are acceptable.

**Formatting Guidelines:**

* Include a cover page that includes the names and student IDs of the members of the group.
* Use 8 1/2" x 11" (22x 28 cm) paper with margins of at least 3/4" (2 cm) all around.
* Use 12-point font in professional fonts such as Times New Roman, Constantia, Arial, etc.
* Text must be single-spaced with a maximum of six lines per inch.
* If you have tables/figures in the .doc file, make sure that the tables/figures is formatted to fit the document (with **legible font size**). Format the size of the tables/figures so that you leave a margin of at least 3/4" (2 cm) all around.

The Horizon Aircraft Company is preparing a contract proposal to submit to the Global Airlines Company for a new commercial aircraft, the JK60. Part of the proposal is a development and production schedule for completion of the first aircraft.

The project consists of three primary categories: (1) engine design and development; (2) development and production of the airframe (e.g., the aircraft body); and (3) design and development of the aircraft avionics (e.g., the electronic systems, equipment, and other devices used to operate and control the aircraft). The table lists the project activities with time estimates (in months).

**Analyse the project by answering the following questions:**

Q 1: Construct the project network (activity-on-node diagram). List all the paths of the project network.

Q 2: Using the **“most likely”** time estimates, what is the completion time for this project? Identify the critical path(s) of the project. Identify the critical and non-critical tasks. What is the cost of the project?

Q 3: Using the **“most optimistic”** time estimates, what is the completion time for this project? Identify the critical path(s) of the project. Identify the critical and non-critical tasks. What is the cost of the project?

Q 4: Using the **“most pessimistic”** time estimates, what is the completion time for this project? Identify the critical path(s) of the project. Identify the critical and non-critical tasks. What is the cost of the project?

Q 5: If **we account for the uncertainty in the duration of the tasks**, what is the estimated completion time for this project? (Use the “expected time” estimates for your calculations). Identify the critical path(s) of the project. Identify the critical and non-critical tasks. What is the cost of the project? Compute the range of the project durations by accounting for the uncertainty in the duration of the tasks.

Q 6: Based on the information provided, what is the maximum crashing that can be achieved. Clearly indicate the activities to crash, the resulting expected project time, and associated costs at each step.

Q 7: Plot the crashing cost curve (project duration vs. total project cost). What insights do this curve provide?

**Table 1: Project Data (Time and Activity)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Activity | Description | Activity Predecessor | Optimistic Time Estimate  (months) | Most likely Time Estimate  (months) | Pessimistic Time Estimate  (months) |
| 1 | General design | - | 6 | 10 | 24 |
| 2 | Engine design | - | 20 | 35 | 60 |
| 3 | Airframe design | 1 | 5 | 17 | 33 |
| 4 | Avionics design | 1 | 2 | 8 | 21 |
| 5 | Develop test engine | 2 | 6 | 9 | 15 |
| 6 | Develop test airframe | 3 | 7 | 12 | 17 |
| 7 | Develop interim avionics | 4 | 6 | 16 | 27 |
| 8 | Engine Development | 2 | 18 | 25 | 42 |
| 9 | Assemble test aircraft | 5, 6, 7 | 5 | 8 | 11 |
| 10 | Test avionics | 4 | 4 | 11 | 16 |
| 11 | Engine/airframe flight trials | 9 | 5 | 10 | 13 |
| 12 | Avionics flight trails | 10 | 5 | 9 | 26 |
| 13 | Engine production | 8 | 10 | 15 | 18 |
| 14 | Airframe production | 11 | 11 | 14 | 21 |
| 15 | Avionics production | 11, 12 | 12 | 16 | 26 |
| 16 | Final assembly/finish | 13, 14, 15 | 3 | 5 | 6 |
| **Table 2: Crashing Data** | | | | | |
|  |  |  |  |  |  |
| Activity | Description | Expected Time | Normal Cost | Crash Time | Crash Cost |
| 1 | General design | 11.67 | 65,700 | 10 | 72,500 |
| 2 | Engine design | 36.67 | 285,000 | 30 | 322,500 |
| 3 | Airframe design | 17.67 | 93,400 | 15 | 103,600 |
| 4 | Avionics design | 9.17 | 74,200 | 8 | 92,000 |
| 5 | Develop test engine | 9.50 | 87,200 | 9.50 | 87,200 |
| 6 | Develop test airframe | 12.00 | 85,000 | 10 | 97,000 |
| 7 | Develop interim avionics | 16.17 | 88,300 | 14 | 124,000 |
| 8 | Engine Development | 26.67 | 236,400 | 25 | 297,400 |
| 9 | Assemble test aircraft | 8.00 | 62,900 | 8 | 62,900 |
| 10 | Test avionics | 10.67 | 63,900 | 10 | 79,900 |
| 11 | Engine/airframe flight trials | 9.67 | 77,600 | 9.67 | 77,600 |
| 12 | Avionics flight trails | 11.17 | 69,100 | 10 | 85,100 |
| 13 | Engine production | 14.67 | 109,800 | 14.67 | 109,800 |
| 14 | Airframe production | 14.67 | 112,500 | 14.67 | 112,500 |
| 15 | Avionics production | 17.00 | 97,200 | 15 | 105,000 |
| 16 | Final assembly/finish | 4.83 | 25,000 | 4.83 | 25,000 |