**SID: 480110301**

**Question 1**

1. Let be the amount of investment in fund A and B, .

Constraints:

Objective: ***maximize***

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The objective value represents that the maximum return rate is 13.25%. therefore the investment in fund A is $60000 while the investment in fund B is $20000. In this case the risk is 0.55.

1. Let be the amount of investment in fund A and B, .

Constraints:

Objective: ***minimize***

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The objective value represents that the minimum risk is 0.475. therefore the investment in fund in fund A is 30000 while the investment in fund B is 50000. In this case the overall return rate is 12.125%.

1. Let be the amount of investment in fund A and B, .

Minimum risk: 0.475; Maximum return rate: 0.1325

Constraints:

Objective: ***minimize Q***

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The objective value indicates that the minimum value of percentage deviation Q is 5.52%. , therefore the optimal solution of investments is for fund A and for fund B. In this case, the overall return rate is 12.5% and the risk is 0.5.

**Question 2**

1. **AON:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Activity** | **Duration** | **EST** | **EFT** | **LST** | **LFT** | **Slack** |
| **A** | **13** | **0** | **13** | **1** | **14** | **1** |
| **B** | **23** | **0** | **23** | **0** | **23** | **0** |
| **C** | **18** | **0** | **18** | **4** | **22** | **4** |
| **D** | **8** | **0** | **8** | **6** | **14** | **6** |
| **E** | **8** | **13** | **21** | **14** | **22** | **1** |
| **F** | **6** | **23** | **29** | **23** | **29** | **0** |
| **G** | **7** | **21** | **28** | **22** | **29** | **1** |
| **H** | **4** | **29** | **33** | **29** | **33** | **0** |
| **I** | **4** | **33** | **37** | **33** | **37** | **0** |

Activity B, F, H and I are critical activities.

1. The duration of the project 37 days. The critical path is B-F-H-I.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Activity** | **Normal** | | **Crash** | | | |
| **Time(days)** | **Cost (dollars)** | **Time (days)** | **Cost (dollars)** | **Cost per day** | **Allowable crash** |
| **A** | **13** | **11,000** | **10** | **15,000** | **1333.33** | **3** |
| **B** | **23** | **5,000** | **21** | **6,000** | **500** | **2** |
| **C** | **18** | **3,000** | **15** | **3,500** | **166.67** | **3** |
| **D** | **8** | **1,500** | **6** | **2,000** | **250** | **2** |
| **E** | **8** | **750** | **5** | **1,200** | **150** | **3** |
| **F** | **6** | **600** | **4** | **1,200** | **300** | **2** |
| **G** | **7** | **1,000** | **5** | **1,500** | **250** | **2** |
| **H** | **4** | **250** | **3** | **450** | **200** | **1** |
| **I** | **4** | **200** | **2** | **300** | **50** | **2** |

**There are 6 paths: BFHI, AEFHI, AEGHI, DEFHI, DEGHI, CGHI**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Path** | Normal | I(50) | I(50) | H(200) | F(300) | F(300) | E(150) |
| **BFHI** | 37 | 36 | 35 | 34 | 33 | 32 | 32 |
| **AEFHI** | 35 | 34 | 33 | 32 | 31 | 30 | 29 |
| **AEGHI** | 36 | 35 | 34 | 33 | 33 | 33 | 32 |
| **DEFHI** | 30 | 29 | 28 | 27 | 26 | 25 | 24 |
| **DEGHI** | 31 | 30 | 29 | 28 | 28 | 28 | 27 |
| **CGHI** | 33 | 32 | 31 | 30 | 30 | 30 | 30 |
| **Crashing cost** | | 50 | 50 | 200 | 300 | 300 | 150 |

The earliest completion time is 32 days. It is impossible for the owner to complete the project within 20 days but it can at least meet the requirement of 32 days. The cost is $24350, which is calculated by

**Question 3**

1. Let be the number of trucks where representing large, medium and small.

Constraints:

Objective:

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, therefore 28 large trucks and 42 small trucks are used. The minimum cost is $28700. The mean pollution rating is 7.4 and the mean safety rating is 7.2 for this fleet.

1. Let be the number of trucks where representing large, medium and small.

Constraints:

Objective:

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, therefore 14 large trucks and 56 medium trucks are used. The minimum mean pollute rating is 5.6. In this case, the mean safety rating is 8.2 and the cost is $37100.

1. Let be the number of trucks where representing large, medium and small.

Constraints:

Objective:

文本

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, therefore 70 large trucks are used. The maximum mean safety rating is 9. In this case, the mean pollute rating is 8 and the cost is $45500.

1. Let be the number of trucks where representing large, medium and small.

Minimum mean pollute rating: 5.6

Maximum safety rating: 9

Minimum cost: 28700

Constraints:

Objective:

文本

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, therefore 15 large trucks, 47 medium trucks and 8 large trucks are used. The minimum value of percentage deviation Q is 22.82%. In this case the mean safety rating is 7.99 the mean pollute rating is 5.87 and the cost is $35250.