FINAL EXAMINATION

## name:

Scope of work: four exercises (4 points each) + one small project (7 points)

Duration: 1 hour and 40 minutes

# Decision making (4 points)

Softside Systems has a €100,000 fixed-price contract for installation of a new application system. The project is expected to take 5 weeks and have direct cost worth €50,000. Experience with similar projects suggest s a 30% likelihood that the project will encounter problems that could delay it as much as 3 weeks and increase the cost by €30,000.

By increasing the project staff for an additional cost of €10,000, the likelihood of problems would be reduced to 10%, and the delay and cost would be 1 week and €8,000, respectively.

Make a decision on whether Softside should increase the staff.

# Contracting (4 points)

The Freight Forwarding & Distribution Co. (FF&D) is willing to award Iron Butterfly Inc. the contract for the logistical on-line system project. The project consists of designing, fabricating, and installing a parcel transport, storage, and database system, for automatic placement, storage and retrieval of standardized shipping containers.

Iron Butterfly Inc. has strong engineering and project management expertise, but not comprehensive competence and capacity to install the total scope of work, thus requiring the help of other companies in the tasks of computer software and robotics installation.

FF&D faces strict budget requirements, but a few risks challenge the ceiling budget. On the one hand, the steel component of the supply is a large portion of the project and steel is known to be a price-fluctuating commodity. On the other hand, the system design may be subjected to changes as far as technology may change from the point in time the basic design was developed to the one Iron Butterfly will detail the system engineering and install the system.

You are demanded to define the contract organization and the associated payment scheme.

# Project Scheduling (4 points)

The following project network and associated costs are given below (time in days, cost in €1,000).



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Activity | Normal duration | Normal cost | Crashed duration | Crashed cost |
| A | 6 | 6 | 3 | 9 |
| B | 9 | 9 | 5 | 12 |
| C | 3 | 4.5 | 2 | 7 |
| D | 5 | 10 | 2 | 16 |
| E | 2 | 2 | 2 | 2 |
| F | 4 | 6 | 1 | 10 |
| G | 8 | 8 | 5 | 10 |

What is the earliest the project can be completed and what is the least costly way of doing this? What is the budgeted cost associated with this earliest project duration?

# Project monitoring (4 points)

The team of SA Gold Mine was tasked to sink a 2,000 meter deep ventilation shaft, and then to excavate room for a station at the bottom of the shaft. The approved plan was to sink the shaft within 20 months at a cost of 65,000 R per meter of shaft depth (R =South Africa RAND, R1 = US $0.1244). For the station at the bottom, 30,000 cubic meter of rock would have to be excavated within 3 months at a cost of R700 per cubic meter. The plan assumed a straight line value progress over time.

After the work had begun, the scope of the project was changed to include excavation for a new station halfway down the shaft with a volume of 20,000 cubic meters (Figure below).

It was agreed that the additional work had to be done at the same excavation rate as the bottom station, but due to softer rock than the bottom one, the team agreed on the cost of R500 per cubic meter.

Because of space and resources available, the new station cannot be performed simultaneously to the other tasks. Currently, after 13 months from inception of work, the shaft has reached a depth of 1,400 m below surface and the new halfway station is completed. The actual cost at this time is R90 million.

You are requested an earned value report as well as time and cost estimates at completion by your executive management.

Ventilation shaft

Bottom station

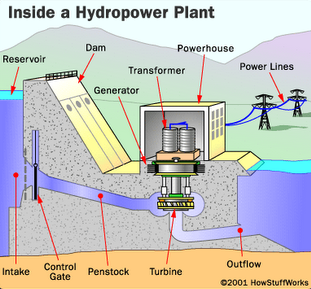
New station

## Small Project (7 points)

Pretend to be the project manager of a project to construct a hydropower plant. Description.

You are asked to plan the project, define the network schedule, calculate the total duration by identifying the critical path, and plot the usage profile for the resource “team of technicians”.

The plant section is represented in the figure above.

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The scope of work is composed of the following tasks and associated durations and cost, when performed by one team of workers:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Task** | **Predecessor** | **Duration (months)** | **Cost (k€)** |
| 1 | Dam (basement) |  | 6 | 2,000 |
| 2 | Dam (reservoir and elevation) | 1, 3 | 4 | 1,500 |
| 3 | Penstock and outflow | 1 | 1 | 500 |
| 4 | Control gate | 1, 2, 3 | 2 | 350 |
| 5 | Turbine | 1, 2, 3 | 3 | 1,200 |
| 6 | Generator | 5, 8 | 1 | 850 |
| 7 | Transformer | 6, 8 | 1 | 450 |
| 8 | Powerhouse | 2 | 2 | 900 |
| 9 | Power lines to backbone interface |  | 3 | 1,000 |

You have no more than 2 teams to be used (maximum available units). All tasks can be performed by 1 or more teams (if you make use of more than 1 team to perform a single task, please consider to have no loss of productivity. For example: 1 team takes 2 months; 2 teams take 1 month).