

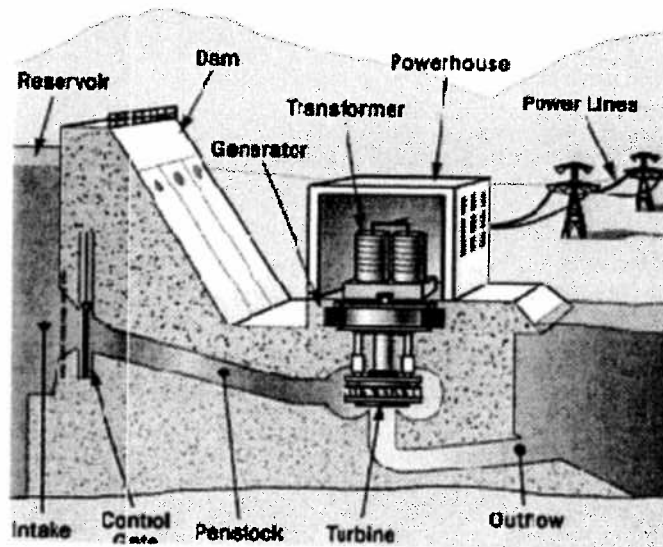
Politecnico di Torino
M.Sc. Engineering & Management
Project Management Course- Instructor: Alberto De Marco
FINAL EXAMINATION – February 24th, 2014

NAME: _____

WITH SOLUTIONS

Exercise 1. SMALL PROJECT (7 POINTS)

Pretend to be the Project Manager of a hydropower plant project. You are asked to plan the scope of work, prepare a budget, define the network schedule, calculate the total duration by identifying the critical path, and plot the resource diagram for the resource "Team of workers".



The plant section is represented in the figure above.

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

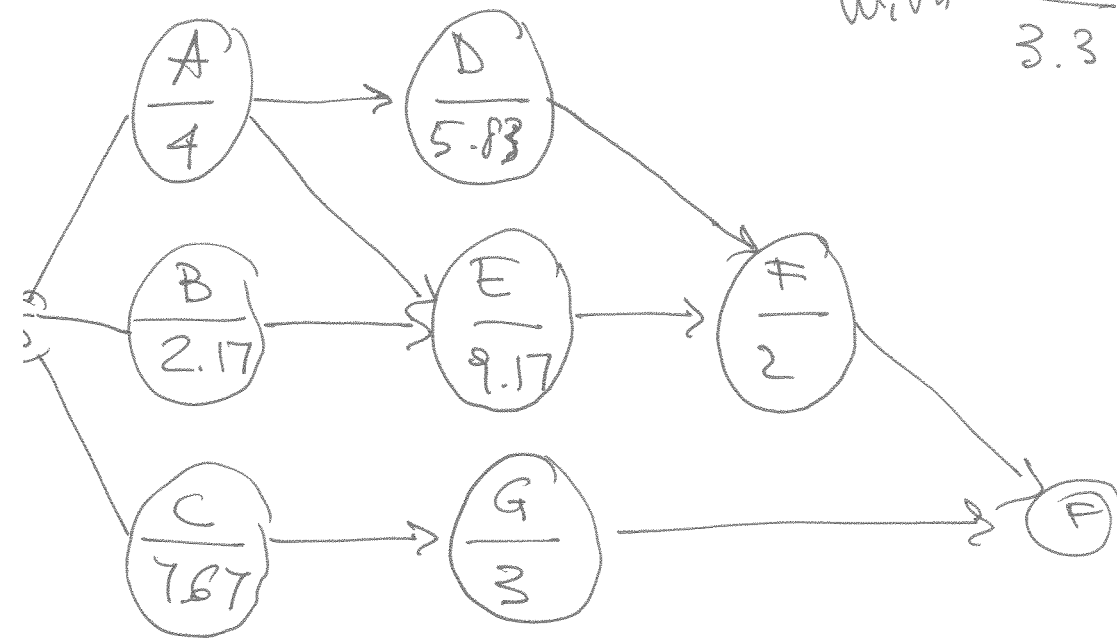
	Task	Predecessor	Duration (months)	Cost (k€)
1	Dam (basement)		6	2,000
2	Dam (reservoir and elevation)	1, 3	5	1,500
3	Penstock and outflow	1	2	600
4	Control gate	1, 2, 3	2	300
5	Turbine	1, 2, 3	3	1,100
6	Generator	5, 8	1	950
7	Transformer	6, 8	1	400
8	Powerhouse	2	4	950
9	Power lines to backbone interface		3	1,100

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 having no loss of productivity. For example: 1 team takes 2 months; 2 teams take 1 month).

EX. 3.

with $\frac{S}{3.3}$ (95% level)

7th event up to average
5.17 level
3.9 only CP



- 1) BEF 13.34
- 2) AEF 15.17 CP
- 3) ADF 11.83
- 4) CG 10.67

average node $\frac{17 - 13.34}{\sqrt{2.75}} = \frac{17 - 13.34}{1.66} = P(2.20)$
~~no need to consider~~
 $P_1 = 98\%$

$$P(z) = \frac{17 - 15.17}{\sqrt{4.13}} = \frac{17 - 15.17}{2.03} = P(0.9019)$$

~~1.19~~ $\Rightarrow P_{cr} \sim 81.6\% \Rightarrow P_1 \times P_2 = 80\%$

with $\frac{S}{6}$

$$P(z) = 94.8\% \approx 95\%$$

no need to consider merge node -

99 level

Activity	Predecessor	a	m	b	exp	s	v
A		2	4	6	4.00	0.67	0.444444
B		2	2	3	2.17	0.17	0.027778
C		4	8	10	7.67	1.00	1
D	A	4	6	7	5.83	0.50	0.25
E	A, B	7	9	12	9.17	0.83	0.694444
F	D, E	1	2	3	2.00	0.33	0.111111
G	C	2	3	4	3.00	0.33	0.111111

BEF	13.33	1.33	0.83	0.91	4.0166	100%
AEF	15.17	1.83	1.25	1.12	1.6398	94.95%
ADF	11.83	1.50	0.81			
CG	10.67	1.33	1.11			
				P		94.95000%

95 level

Activity	Predecessor	a	m	b	exp	s	v
A		2	4	6	4.00	1.21	1.469238
B		2	2	3	2.17	0.30	0.091827
C		4	8	10	7.67	1.82	3.305785
D	A	4	6	7	5.83	0.91	0.826446
E	A, B	7	9	12	9.17	1.52	2.295684
F	D, E	1	2	3	2.00	0.61	0.367309
G	C	2	3	4	3.00	0.61	0.367309

BEF	13.33	2.42	2.75	1.66	2.2091	98%
AEF	15.17	3.33	4.13	2.03	0.9019	81.60%
ADF	11.83	2.73	2.66			
CG	10.67	2.42	3.67			
				P		79.96800%

<i>s</i>	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9932	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

EX. 1

WBS	1
Budget	1
Network	2
Duration constraint	1
Resource constraint	1
Multiple paths	.5
Not optimal	.5

13.5 optimized \rightarrow 14 - 15 correct

SOLUTIONS

EX. 2

Hp: Activity #2 on time

$$SI_{\text{TRAINING}} = \frac{180}{300} = 0.6$$

$$AC_{\text{TR}} = \frac{3}{0.6} = 5 \text{ m}$$

$$SI_{\text{AD}} = \frac{900}{750} = 1.2$$

$$AC_{\text{AD}} = \frac{4}{1.2} = 3.33$$

Adv execution start date = April 1st, 1 m delay

$$CI_{\text{AD}} = \frac{BCWP}{ACWP} = \frac{1,180}{1,270} = .93$$

$$EAC = \frac{3.4 \text{ mil}}{.93} \approx 3.65 \quad \Delta EAC = .25 \text{ mil}$$

Cost for recovery delay:

$$EAC = \frac{3.4 \text{ mil}}{.93 * .6} \approx 6.00 \text{ mil} \quad \Delta EAC = 2.6 \text{ mil}$$

Better loss 2 mil sales than spending 2.6 to recover 1 month delay -

Eschly: REVISED AD EX START DATE = April 1st
REVISED BUDGET $\approx 3.85 \text{ mil}$

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