



# Mid Year 2005 Final Examination

University of South Australia

If you are required to use a calculator during your exam please note the following details:

Calculator Make: \_\_\_\_\_

Calculator Model: \_\_\_\_\_

<b>Student ID:</b>		<b>Student Name:</b>	
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<b>DIVISION OF INFORMATION TECHNOLOGY, ENGINEERING &amp; THE ENVIRONMENT</b>
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<b>SCHOOL OF NATURAL &amp; BUILT ENVIRONMENTS</b>
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<b>Subject Area:</b>	<b>BUIL</b>	<b>Catalogue Number:</b>	<b>2007</b>
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<b>CONSTRUCTION MANAGEMENT 2N</b>
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<b>Examination Day: Wednesday</b>	<b>Examination Date: 22 June 2005</b>
<b>Examination Time: 14.00</b>	<b>Length of Exam: 10 minutes reading time plus 3 hours (3.5 for ENTEXT)</b>

<b>Examination Venue:</b>	Ridley Centre
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<b>Instructions to Candidates</b>
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- This exam is worth 60% of the total course marks
- Please attempt all questions
- The value of each question is noted below
- Any calculator is allowed but no reference materials
- If you find a question unclear, please state your assumption and answer the question based on that

Lecturer: Stefan Hornlund, Phone 8302 2228



**Question 1**

**(15 Marks)**

- a) Explain the following terms;
- 1) Front-end loading
  - 2) Criterion Rate of Return
  - 3) DCF-yield
  - 4) Lead & Lag time (as used in MS Project)
  - 5) Sensitivity analysis
  - 6) Internal Rate of Return
  - 7) Linked barchart
  - 8) Margin (differentiate between Tender, Effective and Final)
- b) A construction project may begin with the development of the initial concept and may end when the main contractor hands a building over to the client. During the life of such a project there is planning/scheduling carried out by several different groups of people. Name four of the main groups that carry out this planning and describe the purposes of the planning they do.

**Question 2**

**(25 Marks)**

- a) Carry out a critical path analysis for the following project in order to determine the total completion time for the project and the critical activities. Illustrate the critical path(s) in the CPM network. Calculate and list the Total and Free floats for all activities.

Activity	Duration	Depends on activity	Cost
A	1 week(s)	-	\$3 000
B	3	A	6 000
C	2	B	8 000
D	3	B	7 500
E	4	-	8 000
F	1	E	6 500
G	2	B and F	8 000
H	4	C and D	4 000
I	2	H	4 000
J	3	D and G	6 000
K	5	J	5 000
L	8	C	8 000
M	2	I and K	4 000
N	4	M	4 000

- b) Once construction activities are about to start, you discover that activities H and I make use of the same equipment and you only have access to one such piece of equipment. What are your choices as far as re-scheduling the project to take this into restriction into account? Evaluate each option by doing the respective re-scheduling and determine which alternative would least affect the project completion time.



- c) Carry out a cash flow analysis for the above project in order to determine the maximum overdraft required, the time when the project breaks even and the final margin. You can assume that it is a 'cost-plus' type contract so the contractor invoices the client, for his costs plus a margin of 10%, after every four weeks. The client makes his/her payment in the following 4-week period but is allowed to withhold 5% as retention of each payment. The retention money is paid to the contractor in the 4-week period following completion.

**Question 3**

**(10 Marks)**

Two investment proposals have the following details:

	<u>Proposal A</u>	<u>Proposal B</u>
Investment cost	\$100 000	\$140 000
Monthly running costs	\$1 500	\$1 600
Major maintenance cost after 2 years	NIL	4 000
Major maintenance cost after 3 years	\$ 9 000	NIL
Major maintenance cost after 4 years	NIL	\$4 000
Monthly income generated	\$4 000	?
Project life span (in years)	6	6
Equipment resale value at end of project	\$30 000	\$40 000

You are first required to calculate the present worth of the profit (NPV) of Proposal A, using an annual discount rate of 10%. Then calculate the monthly income that Proposal B must generate for it to be regarded as equal to Proposal A, e.g. having the same NPV.

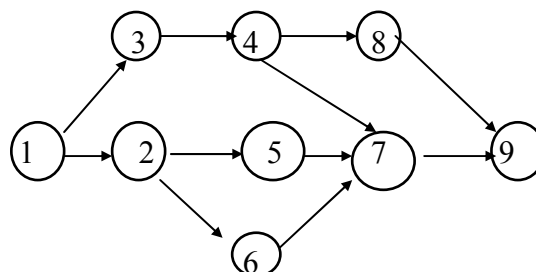
**Question 4**

**(15 Marks)**

The optimistic (o), most likely (m) and pessimistic (p) activity durations have been given for the project described by the network below. Use the scheduling technique PERT to;

- calculate the probability of the whole project being completed within 15 weeks.
- calculate which project completion time would give you at least a 90% probability of completion (in a whole number of weeks).
- calculate the probability of activity 7-9 being able to start in week 11.

Activity	o	m	p
1-2	3	4	5
1-3	4	5	7
2-5	2	3	5
2-6	2	4	8
3-4	2	3	4
4-7	1	1	1
4-8	3	4	6
5-7	2	2	3
6-7	2	3	4
7-9	3	4	5
8-9	2	2	2



END OF QUESTIONS



**FORMULAE SHEET**

This is a standardised formulae sheet and not all formulae may be useful in this particular exam.

**Economic Assessment**

Compound amount of a lump sum (= Compound amount of 1)

$$(1 + i)^n$$

Present worth of a lump sum (=Present worth of 1)

$$\frac{1}{(1 + i)^n}$$

Compound amount of a regular series (= Compound amount of 1 per period)

$$\frac{(1 + i)^n - 1}{i}$$

Sinking fund deposit (= Uniform series that amounts to 1)

$$\frac{i}{(1 + i)^n - 1}$$

Present worth of a regular series (=Present worth of 1 per period)

$$\frac{(1 + i)^n - 1}{i(1 + i)^n}$$

Capital recovery (=Uniform series that 1 will buy)

$$\frac{i(1 + i)^n}{(1 + i)^n - 1}$$

Legend:

i = interest rate per period

n = number of periods

**PERT**

$$t_e = \frac{O + 4xM + P}{6}$$

$$S = \frac{P - O}{6}$$

$$T = \Sigma t_e \pm \sqrt{\Sigma(S^2)}$$

**NORMAL DISTRIBUTION TABLE**

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
.1	.5398	.5435	.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	.7703	.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	.90147
1.3	.90320	.90490	.90658	.90824	.90988	.91149	.91309	.91466	.91621	.91774