



Mid Year 2006 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: _____

Student ID:		Student Name:	
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DIVISION OF INFORMATION TECHNOLOGY, ENGINEERING & THE ENVIRONMENT
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SCHOOL OF NATURAL & BUILT ENVIRONMENTS

Subject Area:	BUIL	Catalogue Number:	2007
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CONSTRUCTION MANAGEMENT 2N

Examination Day: Friday	Examination Date: 23 June 2006
Examination Time: 14.00	Length of Exam: 10 minutes reading time plus 3 hours (3.5 for ENTEXT)

Examination Venue:	Ridley Centre
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Instructions to Candidates

- 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

(17 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
A	2	None
B	5	A
C	3	A
D	1	C
E	4	B and C
F	5	D
G	8	D
H	3	F and ½ G
I	7	E and F
J	4	H and I
K	10	C
L	7	G, K and M
M	12	None

- b) Once construction activities are about to start, you discover that activities G and H make use of the same equipment and you only have access to one such piece of equipment. What are your two main 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 the affect each alternative would have on the project completion time. Which would you recommend and why?

Question 2

(12 Marks)

A contractor has determined that his costs for a project will be distributed as follows:

Period:	1	2	3	4	5	6
Cost:	\$10 000	\$20 000	\$30 000	\$25 000	\$20 000	\$8 000

Each period is four (4) weeks long and the contractor plans to apply a 12% margin for overheads and profit.

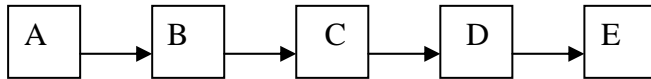
- a) Determine the Nett Present Value for the whole project if the payment plan is 'cost-plus', meaning that the contractor gets paid for his costs plus the margin in the following 4-week period. There are no retention arrangements included in the contract and the annual rate to be used for the discounting is 8%.
- b) If the client wanted to change the payment-plan so that he paid in full, in the period following project completion, how much more or less would he have to pay in order for the contractor's NPV to remain the same as for the cost-plus alternative?



Question 3

(16 Marks)

A housing development consists of 50 houses and the construction of each partly prefabricated house is scheduled as follows:



- A = Footings. Duration = 3 days
- B = Superstructure. Duration = 4 days
- C = Services. Duration = 2 days
- D = External cladding. Duration = 3 days
- E = Finishes. Duration = 3 days

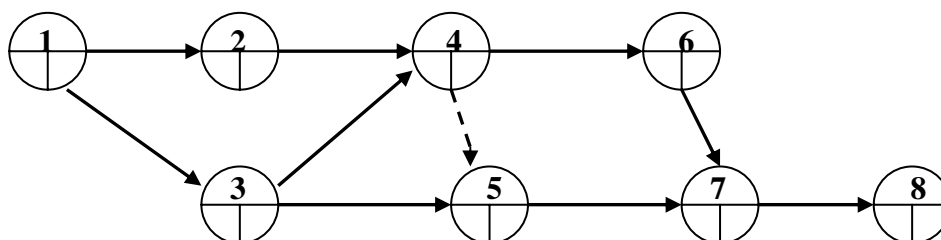
You have access to only one team of workers for each activity so each team must progress from house to house.

- a) What is the shortest possible completion time for this project?
- b) Now assume that all workers must be provided with continuous employment. What is now the shortest possible completion time for the project, if scheduled as per the precedence diagram above?
- c) Next you should assume that you could change the duration for activity 'B' so that for the first 25 houses it takes 4 days/house and for the following 25 houses it takes only 3 days/house. Activity 'C' on the other hand takes 2 days/house for the first 25 houses and 3 days/house for the following 25 houses. How quickly can you now complete all 50 houses if all workers must have continuous employment, and did this result in a time saving?
- d) Finally, assume that you can change the duration of all activities on the condition that the cycle time, i.e. the time it takes to build one house, remains unchanged. All workers must still be provided with continuous employment. How would you change the durations in order to minimize the project completion time and how long would it then take?

Question 4

(15 Marks)

Below is the activities network for a project. The table has the optimistic (O), most likely (M) and pessimistic (P) duration for each of the activities.





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Activity	O	M	P
1-2	2	3	4
1-3	2	3	5
2-4	4	5	6
3-4	3	4	5
3-5	3	5	7
5-7	2	2	3
4-6	2	2	2
6-7	1	1	2
7-8	2	3	5

- Determine what the probability is of the project being completed within 14 weeks
- Determine what the probability is of the project being completed within 15 weeks
- Determine what the probability is of activity 5-7 starting after 8 weeks.

END OF QUESTIONS



FORMULAE SHEET

This is a standardised formulae sheet and not all formulae are necessarily useful in this 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

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

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

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

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