

**UNIVERSITY OF SOUTH AUSTRALIA
SCHOOL OF GEOINFORMATICS, PLANNING & BUILDING**

**PROGRAM(S): Bachelor of Construction Management & Economics &
Diploma in Built Environment**

COURSE: CONSTRUCTION MANAGEMENT 2N (10278)

EXAMINATION: Internal Exam, Semester 1, 2003

**DURATION: 3 Hours of Exam time preceded by 10 minutes of Reading
time, a total of 3 Hrs 10 Mins.
For ENTEXT students, 10 minutes of Reading time plus 3.5
Hours of Exam time, a total of 3 Hrs 40 Mins.**

EXAMINER: Stefan Hornlund, Tel 8302 2228

INSTRUCTIONS TO CANDIDATES:

- This exam is worth 60% of the total course marks
 - Attempt all questions
 - All questions are of equal value
 - No reference materials are allowed. Calculator is allowed.
 - State any assumptions made
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NOTES FROM EXAMINER:

A normal distribution table and a sheet with various formulae have been attached to the exam paper.

Question 1

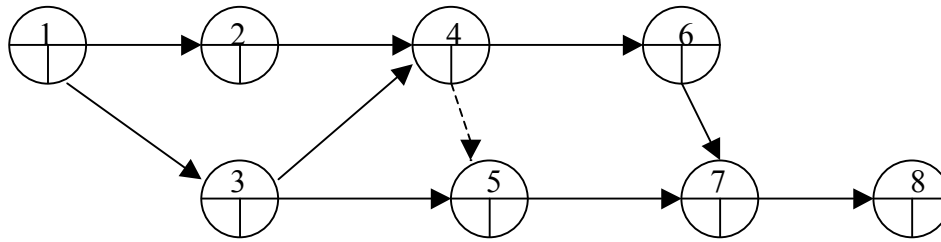
a) Explain the following eight terms;

- | | |
|-----------------------------|-------------------------|
| 1) Front-end loading | 5) Effective Margin |
| 2) Criterion Rate of Return | 6) DCF-yield |
| 3) Line of Balance | 7) Sensitivity analysis |
| 4) Internal Rate of Return | 8) Retention |

b) Describe the main advantages and weaknesses of using pure bar-charts for scheduling a project. Also describe how we can improve on those weaknesses?

Question 2

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



Activity	O	M	P
1-2	2	3	5
1-3	2	2	3
2-4	4	5	6
3-4	3	3	5
3-5	3	4	5
5-7	2	2	3
4-6	2	2	2
6-7	1	1	1
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 16 weeks
- Determine what the probability is of activity 5-7 starting after 9 weeks.

Question 3

Your costs for a particular construction project are distributed as per the following table. Each period is 4 weeks long.

Period:	1	2	3	4	5	6
Cost:	\$4 000	8 000	12 000	18 000	10 000	2 000

Your company has a policy of applying a margin of 5% on to all costs before invoicing the client.

- Use an annual discount rate of 12% to determine the net present value (NPV) of the total margin for the following two alternative payment plans:

Alt 1: 'Cost-plus', where you invoice the client for your costs plus the margin at the end of each period. You receive the money, less 2% retention, from the client in the following period. The retention money will be paid to you in full during period 8.

Alt 2: The total contract sum is divided into two equal lump-sum payments, one in period 4 and one in period 7. The above arrangement regarding retention and retention repayment applies also in this case.

- b) Determine how much bigger or smaller the contract sum, using the second payment plan, would have to be for the NPV of this alternative to be the same as for Alternative 1.

Question 4

- 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	3 weeks	-	\$15 000
B	2	A	20 000
C	3	A	30 000
D	3	-	6 000
E	4	B and C	20 000
F	3	C	18 000
G	3	B	18 000
H	3	E	24 000
I	3	F	48 000
J	2	G and H	20 000
K	2	I	30 000
L	4	J	40 000
M	3	J	15 000
N	5	J and K	25 000
P	5	M and N	5 000
R	1	P	3 000

- b) Now assume that activities M and N make use of the same equipment and there is only one such set available. Evaluate the alternatives for how you could cope with this and comment on the differences.
- 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 the contractor invoices the client, for his costs plus a margin of 8%, after every four weeks and that the client pays the full amounts in the following four-week period. Also plot the Accumulated Net Cash graph.

END OF QUESTIONS

FORMULAE SHEET

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

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

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

$$T = \sigma t_e \pm \sigma S^2$$