

**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, 2002

**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

NOTES FROM EXAMINER:

Question 1

You are considering which equipment to invest in for a new manufacturing business. The three alternatives have the following details:

	<u>Alternative A</u>	<u>Alternative B</u>	<u>Alternative C</u>
Investment cost	\$300 000	200 000	\$400 000
Monthly running cost	\$2 000	\$2 300	\$2 500
Major maintenance after 3 years	NIL	NIL	\$8 000
Major maintenance after 4.5 years	\$15 000	NIL	NIL
Major maintenance after 6 years	NIL	NIL	\$8 000
Monthly income generated	\$6 000	\$6 200	?
Equipment life span	9 years	4.5 years	9 years
Equipment resale value at end of life	\$100 000	\$50 000	\$130 000

- c) You are first required to compare Alternatives A and B by calculating the present value (NPV) of the profits, using an annual discount rate of 10%. This comparison should be made over 9 years.
- d) Next you are required to calculate the amount of Monthly income that Alternative C must generate for that to be an equally good investment to Alternative A.

Question 2

- c) 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 days	-	\$3 000
B	5	A	10 000
C	4	A	8 000
D	10	B	30 000
E	3	Half of D	12 000
F	8	C	16 000
G	5	F	2 000
H	8	E and F	6 000
I	2	D, G and H	2 000
J	6	D and I	3 000
K	3	I	4 500
L	4	I	3 000
M	4	J and K	2 000

- d) Carry out a cash flow analysis for the above project in order to determine the maximum overdraft that is required, the time when the project breaks even and the final margin. You can assume that the contractor invoices the client, for costs plus a margin of 10% after every week (= 5 working days) and that the client pays those amounts, less a retention of 5%, in the following period. Final inspection will take place a week after the end of the construction activities and the retention money is to be repaid in the week following that inspection. Also plot the Net Accumulated Cash graph at an appropriate scale.

Question 3

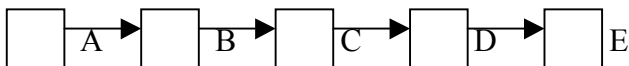
- b) Explain the following eight terms;

- | | |
|-----------------------------|-------------------------|
| 5) Front-end loading | 5) Effective Margin |
| 6) Criterion Rate of Return | 6) DCF-yield |
| 7) Line of Balance | 7) Sensitivity analysis |
| 8) Internal Rate of Return | 8) Linked barchart |

- c) 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 that planning.

Question 4

A housing estate consists of 50 identical, partly prefabricated, houses. The construction schedule for each house looks like this:



The duration of the activities is as follows:

A = 2 weeks, B = 3 weeks, C = 2 weeks, D = 4 weeks and E = 2 weeks

You only have enough workers for one gang for each activity.

- d) Determine the shortest possible completion time for the project. Assume that you are allowed to have workers coming and going as you please, in other words, activities do not have to be continuous.
- e) Produce a line-diagram for how the project would have to be scheduled if all workers must be given continuous employment. How much longer would it now take to complete the project?
- f) You note that activity D is the slowest so you come up with the idea to start as per the above but after 25 houses you take some workers from activity E and add them to activity D. That has the effect of speeding up activity D and slowing down activity E so that they each take 3 weeks for houses 26 - 50. Would that affect the project completion time and if so, by how much?

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

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

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