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CEL 779		CONSTRUCTION ECONOMICS AND FINANCE	MAJOR TEST	
Time 8:00-10:00	2 hour		Maximum Marks	40
Venue	V 417 + V418		Date	08.05.2007

ASSUME MISSING DATA SUITABLY IF REQUIRED.

There are four questions. Each of the questions carries 10 marks.

Q 1.

Plans are underway to introduce a new machine to increase output. There are two alternatives, machine A and B. Acquisition cost of the former is $30,000 and for the latter is $50,000. Operating costs are paid at the end of each month in proportion to the number of units produced. Fixed costs are paid at the end of each half-year. Assume that fixed costs are not required for zero units of production, the useful life of either machine is 4 years, and the cost of capital is 1% compounded monthly. Specific costs for each machine are shown below.

	Machine A	Machine B
Operating cost (per unit)	$0.70	$0.50
Fixed cost (every 6 months)	$800	$1300

(a) Find the break-even production level at which machines A and B are equally attractive.

(b) If the two machines have already been purchased, determine which machine should be used at different levels of production for greatest economy.

Q 2.

In order to increase the production of a precast concrete manufacturing plant, a new and fully equipped factory is required at an estimated cost of Rs. 45 Lakhs. This is expected to increase the turnover of the company to Rs 200 Lakhs per annum broken down as 40% materials, 35% wages and other production costs, 15% administration, the remaining 10% representing profit. On an average the concrete unit takes two weeks to produce, after which they are put into store until fully cured and ready for sale. The average period between completion of manufacture and sale is two months, and two month's credit is allowed for customers. Three months' supply of raw materials will be kept in stock at all times, for which suppliers allow one and a half months' credit.

From the above data,
(a) determine the working capital required to start the new business
(b) determine the working capital to finance the normal transactions.

Q 3

There are two options for selecting a project. The details of these two options are given below:

Option A	Option B
Investment of $20,000	Investment of 40,000
Cash in or revenue for the first five years 10000, 20000, 40000, 45000, and 60000 respectively	Cash in or revenue for the first five years 20000, 30000, 50000, 60000 and 70000 respectively
Cash out or expenditure for the first five years: 7000, 15000, 30000, 35000, and 50,000 respectively	Cash out or expenditure for the first five years: 17000, 20000, 35000, 40000, and 60000 respectively

The discounted factors for determining the net present value are:
For year 1, 0.90
For year 2, 0.80
For year 3, 0.70
For year 4, 0.60
For year 5, 0.50

(a) Determine which option should you go?
(b) Total profit for option A
(c) Average profit per year for option B
(d) ROI for both the option A and B.

Q 4

An investment is being considered that requires $ 1 million and commits the money for 10 years. During that period it is equally likely that the annual returns from the investment will be $100,000, $150,000, and $200,000. The probability is 0.75 that the salvage value will be $300,000, but there is 1 chance in 4 that it will be zero. A minimum rate of return of 10% is expected.

(a) Construct an investment risk profile for the proposal on a chart in which the horizontal axis registers the net PW and the vertical axis is a probability scale ranging from 0 to 1. Draw the curve to show the probability of returns equal or less than the scaled PWs.

(b) How could the investment risk profile contribute to the economic evaluation of the million-dollar investment?

4. Show that if the relational equation $\beta \circ ? = \gamma$ has some solution α [[i.e. given $Y \xrightarrow{\beta} Z$, $X \xrightarrow{\gamma} Z$ two harpoons, there is some harpoon $X \xrightarrow{\alpha} Y$ such that $\beta \circ \alpha = \gamma$]] then there exists a maximal solution

[[Hint You need to show that $(\gamma^{\circ\flat} \bowtie \beta)^{\circ\flat}$ is a solution and that $\alpha \leq (\gamma^{\circ\flat} \bowtie \beta)^{\circ\flat}$ is satisfied]]

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5. Interpret if A then B else C as $(A \times B) \cup (\bar{A} \times C)$ for fuzzy sets $A, B, C : X \to [0,1]$

where $A \times B$ is given by $A(x) \wedge B(x)$ and $\bar{A}(x) = 1 - A(x)$;

$(A \cup B)(x) = A(x) \vee B(x) = \max\{A(x), B(x)\}$.

[[Hint You need to justify the connective if .. then .. else as $(A \times B) \cup (\bar{A} \times C)$ for the classical two valued logic $\{0, 1\}$, 0 = false, 1 = true taking $\times$ as cartesian product, $\bar{A} = X \setminus A$ ~~for~~ when A, B, C are subsets of X and if A then B else C means if $x \in A$ then $x \in B$, if $x \notin A$ then $x \in C$. Then prove that for fuzzy sets, the formula is a generalization of the classical situation i.e. reduces to the classical case if A, B, C are constrained to take values 0 and 1 only]]

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