

ECE 4000
Quiz #1 Solution

RC
9/18/02

1. A. $P = A (P/A, i\%, n)$

$$P = 8,000 (P/A, 6\%, 10)$$

$$(P/A, 6\%, 10) = \frac{(1+i)^n - 1}{i(1+i)^n} = \frac{(1.06)^{10} - 1}{.06(1.06)^{10}} = 7.3601$$

$$P = 8,000(7.3601) = \$58,881$$

B. 8% per year, nominal = $\frac{8\%}{4} = 2\%$ quarterly
5 years = 20 periods (quarters)

$$F = A (F/A, i\%, n)$$

$$F = 8,000 (F/A, 2\%, 20)$$

$$(F/A, 2\%, 20) = \frac{(1.02)^{20} - 1}{.02} = 24.2974$$

$$F = 8,000(24.2974) = \$194,379$$

C. Let $K_1 = 1^{st}$ two payments = 6,000

$2K_1 =$ last four payments = 12,000

several solutions

$$P = K_1 (P/A, 8\%, 2) + 2K_1 (P/A, 8\%, 4) (P/F, 8\%, 2)$$

$$\text{or } P = K_1 (P/A, 8\%, 6) + K_1 (P/A, 8\%, 4) (P/F, 8\%, 2)$$

$$(P/A, 8\%, 2) = \frac{(1.08)^2 - 1}{.08(1.08)^2} = 1.7833$$

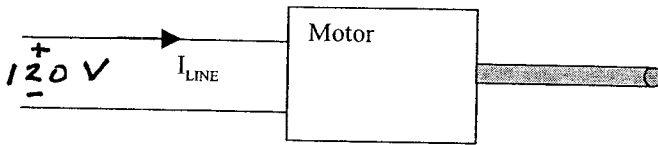
$$(P/A, 8\%, 4) = \frac{(1.08)^4 - 1}{.08(1.08)^4} = 3.3121$$

$$(P/F, 8\%, 2) = (1.08)^{-2} = .8573$$

$$P = 6,000 (1.7833) + 12,000 (3.3121)(.8573)$$

$$P = \$44,775$$

2.



A. COST = INPUT Power
IN Kilowatts $\cdot \frac{\$.08}{\text{KW-hr}} \cdot \frac{360 \text{ DAYS}}{\text{YEAR}} \cdot \frac{12 \text{ hours}}{\text{DAY}}$

$$\text{COST} = 20 \text{ KW} \times \frac{345.6}{\text{KW-YEAR}}$$

$$\text{COST} = \$6,912/\text{year}$$

B. $P = F_1 (P/F_1, i\%, g\%, n)$

$$(P/F_1, 6\%, 5\%, 8) = \frac{(1+i)^n - (1+g)^n}{(i-g)(1+i)^n} = \frac{(1.06)^8 - (1.05)^8}{(.01)(1.06)^8}$$

$$P/F_1 = 7.0326$$

$$P = 600 (7.0326) = \$4382$$

C. If input power AND efficiency are UNCHANGED, OUTPUT power is UNCHANGED. ($P_{\text{OUT}} = P_{\text{IN}} \cdot \text{eff.}$)

$$I_1 = \frac{P_{\text{IN}}}{V(PF_1)} \quad I_2 = \frac{P_{\text{IN}}}{V(PF_2)}$$

$$\frac{I_2 - I_1}{I_1} = \frac{1/PF_2 - 1/PF_1}{1/PF_1} = \frac{1/.9 - 1/.8}{1/.8} = -.111 = -11.1\%$$

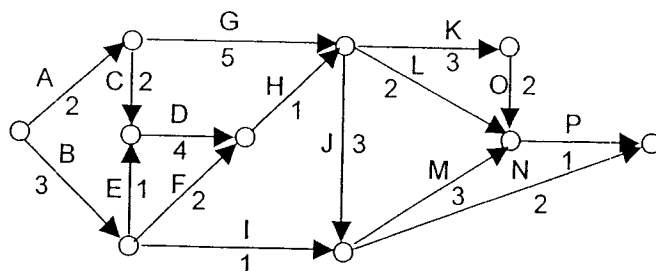
(d)

3.A. For a PERT chart, the project completion time is the sum of the activity times along a critical path. It is assumed that the individual activity times are uncorrelated random variables, and that the central limit theorem applies to their sum. The project completion time would then be a normally distributed random variable. (b)

B. the term reuse refers to putting a device, or a modular part of a device into service again. If there is a change in technology the reuse process may become uneconomical (a)

C. Recitation #2 discussed the staggered parallel development of a family of microprocessors to produce progressively high performance machines. (c)

4.



A. Critical Path = Longest Path

= ACDHJMP and
BEDHJMP

B. Length of critical path = Project Duration

$$= 2+2+4+1+3+3+1 = 3+1+4+1+3+3+1 = 16$$

(i) Float for activity D = 0, since all activities on the critical path have float = 0.

(ii) Latest Start = Project Duration - Length of Longest Backward Path

$$\text{Latest Start for Activity G} = 16 - 12 = 4$$

$$\text{Earliest Start for Activity G} = 2$$

$$\text{Float for Activity G} = \text{LS} - \text{ES} = 4 - 2 = 2$$

C. Variance = $\sigma^2 = 4 \text{ months}^2$

Standard Deviation = $\sigma = 2 \text{ months}$

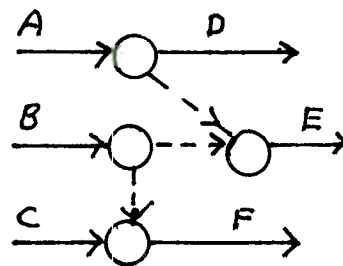
$$z = \frac{T - T_e}{\sigma} = \frac{14 - 16}{2} = -1$$

From Tail-End z-distribution,

$$\text{Prob}(z > -1) = 1 - z(1) = 1 - .159 = .841$$

D. Logical Relations:

A Before D
A and B Before E
B and C Before F



Note: 3 Dummy

Activities Required

5.A. Between is used when there are two persons or items; Among is used when there are more than two; Between the two students, Among the three students.

Effect may be used as a verb meaning "to bring about," as in "to effect a solution." # |

B. Less Applies to MATTERS of Reduced degree; fewer Applies to items THAT ARE COUNTABLE. One would say "fewer children," AS opposed to "less children," which is incorrect. Periods of time CAN Be Described using either less or fewer: "fewer than six hours" is correct. #1

C. BIENNIAL MEANS occurring every two years. BIENNIAL MEANS either every two years or twice A YEAR; SEMIMONTHLY MEANS twice A MONTH. BIMONTHLY MEANS either twice A MONTH or every two months. #1

6. A. A prototype is AN original Model, usually subjected to testing. The design DOES NOT have to first Be simulated, although it could Be. Simulation is the representation of the operation or features of a process through ANOTHER process. False

B. PARTITIONING is the separating of A design INTO multiple PARTS AT the same level of ABSTRACTION. This SEPARATION allows multiple items to Be TACKLED in PARALLEL. The CALENDAR time to completion is determined by the CALENDAR time of the longest PART, in general shorter than the CALENDAR time required for A less-PARTITIONED design, even AT the expense of requiring more personnel. False

RC

C. If the group has N members, each member can interact with $N-1$ others. By considering each member, there are $\frac{N(N-1)}{2}$ possible interactions, with the 2 in the denominator preventing double counting. For large N , the leading term is $\frac{N^2}{2} \propto N^2$. False