

ECE 4000
Quiz #1 Solution

RC
2/6/02

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

$$P = 5,000 (P/A, 6\%, 10)$$

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

$$P = 5,000 (7.3601) = \$36,800$$

B. 10% per ANNUM = $\frac{.10}{2} = 5\%$ SEMIANNUALLY
(10% = NOMINAL RATE)

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

$$(F/A, 5\%, 16) = \frac{(1+i)^n - 1}{i} = \frac{(1.05)^{16} - 1}{.05} = 23.6575$$

$$F = 8,000 (23.6575) = \$189,260$$

APPROXIMATE SOLUTION:

$$A_{\text{year}} = (8,000) 2 = 16,000$$

$$F = 16,000 (F/A, 10\%, 8) = 16,000 \left(\frac{(1.1)^8 - 1}{.1} \right)$$

$$F = \$182,974 \text{ (APPROX.)}$$

C. Several Solutions:

$$P = 6,000 (P/A, 8\%, 6) + 6,000 (P/A, 8\%, 4)$$

$$\text{or } P = 12,000 (P/A, 8\%, 4) + 6,000 (P/A, 8\%, 2) (P/F, 8\%, 4)$$

$$(P/A, 8\%, 6) = \frac{(1.08)^6 - 1}{.08(1.08)^6} = 4.6229$$

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

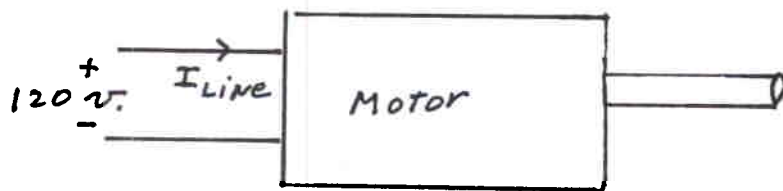
$$(P/A, 8\%, 2) = \frac{(1.08)^2 - 1}{.08(1.08)^2} = 1.7833$$

$$(P/F, 8\%, 4) = (1.08)^{-4} = .7350$$

$$P = 6,000 (4.6229) + 6,000 (3.3121) =$$

$$P = 47,610$$

2.



$$A. \text{ COST} = \frac{\text{input power in kilowatts}}{10^3} \times \frac{\$.06}{\text{KW-hr}} \times \frac{300 \text{ days}}{\text{year}} \times \frac{16 \text{ hours}}{\text{day}}$$

$$= \frac{120(200)(.75)}{10^3} \text{ KW} \times \frac{\$ 288}{\text{KW-year}}$$

$$= \$ 5,184/\text{year}$$

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

$$P/F_1 = \frac{(1+i)^n - (1+g)^n}{(i-g)(1+i)^n} = \frac{(1.06)^8 - (1.04)^8}{(.06-.04)(1.06)^8} = 7.06714$$

RC

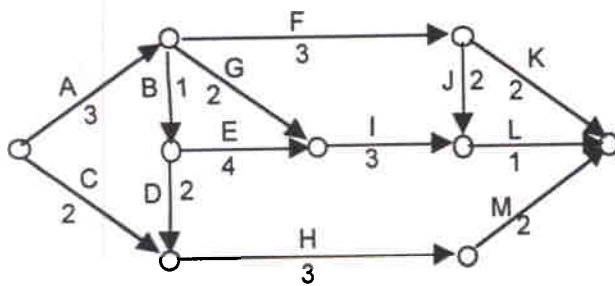
$$P = 400(7.06714) = \$2,827$$

- C. Lowest cost solution may not be best because there may be other long term costs not accounted for. There is more than one type of motor to install, purchase, and maintain. Another option might give more excess capacity in case of plant expansion.
3. The primary advantage of Gantt charts over CPM diagrams for project scheduling is that Gantt charts clearly show the chronological relations among the various activities. CPM diagrams more clearly show the logical precedence relations (a).
- B. A utility company sometimes adjusts the cost of power if a purchaser adjusts the load power factor because line losses can be reduced. A plant typically has a lagging power factor because of the induction motors. The effective value of line current is inversely proportional

To the power factor, for constant real power. The losses due to line resistance are proportional to the square of the line current. Therefore, changing the power factor to be closer to unity reduces line loss, which saves the utility company money (b).

c. The technical purpose of the development of the family of microprocessors was to develop progressively high performance machines (c).

4.



A. Critical path = Longest path
= ABEIL

B. Length of critical path = Project Duration
= 3 + 1 + 4 + 3 + 1
= 12

(i) Float for Activity B = 0 [All critical path activities have float = 0]

(ii) Latest start = Project Duration - Length of Longest backward path

LATEST START for Activity D = $12 - 7 = 5$

EARLIEST START for Activity D = $3 + 1 = 4$

FLOAT = $LS - ES = 5 - 4 = 1$
of Activity D

$$C. t_{\text{expected}} = \frac{t_s + 4t_m + t_l}{6} = \frac{2.2 + 4(3.0) + 5.8}{6} = 3.33$$

D. VARIANCE = $\sigma^2 = 4 \text{ MONTHS}^2$

STANDARD DEVIATION = $\sigma = 2 \text{ MONTHS}$

$$z = \frac{T - T_e}{\sigma} = \frac{21 - 18}{2} = 1.5$$

FROM TAIL-END Z-DISTRIBUTION,

$$\text{PROB}(z > 1.5) = .0668 = 6.7\%$$

5.A. EFFECT AS A NOUN IS THE COMMON USAGE, AND MEANS "THE RESULT," AS IN "THE EFFECT OF THE STORM"

AFFECT AS A NOUN IS RARELY USED, AND MEANS "AFFECTATION."

EFFECT AS A VERB MEANS "TO BRING ABOUT," AS IN "TO EFFECT A SOLUTION."

AFFECT AS A VERB MEANS "TO ACT UPON" #1

B. BETWEEN IS USED WHEN THERE ARE TWO ITEMS,

AND AMONG IS USED WHEN THERE ARE MORE THAN TWO: AMONG THE THREE TESTED, BUT

BETWEEN THE TWO GIRAFFES. #2

6. A PROTOTYPE IS AN ORIGINAL MODEL, USUALLY SUBJECTED TO TESTING. THE DESIGN OF THE PROTOTYPE DOES NOT HAVE TO BE MODULAR, WHICH MEANS ASSEMBLAGE OF COMPONENTS IN A SELF-CONTAINED MANNER. FALSE

B. When there is hierarchical decomposition in the design into modules, then the design success becomes very dependent on the definition of the interfaces between and the interactions among the sub-elements (the modules have to fit together properly)
TRUE

C. When the design is partitioned, or broken into parts at the same level of abstraction, then more parallelism of effort is achieved. The time to completion is closely related to the time of the longest partition, typically resulting in shorter calendar time to completion.
TRUE

D. The number of interactions in a group of N people is $\frac{N(N-1)}{2}$, which is proportional to N^2 for large N . FALSE