H.W. Set #2 (ME 355)

3.1

Manual UAC = $-15{,}000\,(A/P, 10\%, 10) - 30{,}000$

$= -15{,}000 \times 0.1628 - 30{,}000 = -32{,}442$

Automatic UAC = $-95{,}000\,(A/P, 10\%, 7) - 10{,}000$

$+15{,}000\,(A/F, 10\%, 7)$

$= -95{,}000 \times 0.2054 - 10{,}000$

$+15{,}000 \times 0.1054$

$= -27{,}932$

The automatic operation is more economical because its Uniform Annual Cost is lower.

3.2 Manual UAC = $-15{,}000\,(A/P, 20\%, 10) - 30{,}000$

$= -33{,}578$

Automatic UAC = $-95{,}000\,(A/P, 20\%, 7) - 10{,}000$

$+15{,}000\,(A/F, 20\%, 7)$

$= -35{,}192$

The manual operation is preferred because its Uniform Annual Cost is lower. The reason for the result being different from that of Prob. 3.1 is that a higher rate of return drives up the annual cost of capital equipment.

3. $UAC = -50,000(A/P, 25\%, 3) + 20,000(A/F, 25\%, 3) - 4,000 \times 8$

$= -50,000 \times 0.5123 + 20,000 \times 0.2623 - 32,000$

$= -52,369$

The production cost per unit is

$$\frac{-52,369}{4,000 \times 10} = \$1.308$$

4. $UAC = [-300,000(A/P, 25\%, 10) + 30,000(A/F, 25\%, 10)] \times (1+0.3) - 10 \times 2,000 \times (1+0.5)$

$= (-300,000 \times 0.2801 + 30,000 \times 0.0301) \times 1.3 - 10 \times 2,000 \times 1.5$

$= -138,065$

The hourly rate of this worker-machine system is

$$\frac{138,065}{2,000} = \$69.03/hr$$