

Since the upstream pressure is known, substitute for P_1 and convert from atm to psi.

$$P_2 = 10.3333 (P_1) = 10.3333 (1atm) \left(\frac{14.7psi}{atm} \right) = 152psi$$

Alternatively, since the table values have been generated for convenience, it is also valid to use the underlying formulas to solve for the pressure ratio. The ratio of specific heats, k , is assumed to be 1.4.

$$\frac{P_2}{P_1} = \left(\frac{1}{k+1} \right) [2kM_1^2 - (k-1)]$$

$$\frac{P_2}{P_1} = \left(\frac{1}{1.4+1} \right) [2(1.4)(3)^2 - (1.4-1)] = 10.3333$$

The rest of the solution follows from the first approach.

Answer D

46.3 A company purchases a factory for \$1M with a salvage value of \$300K in 15 years. Operations and maintenance costs are \$40K/year. At an interest rate of 8%, what is the equivalent uniform annual cost of the factory over the next 15 years?

- A. \$70K
- B. \$90K
- C. \$150K
- D. \$170K

Draw a cash flow diagram or make a list of cash flows. Since the problem is asking for EUAC, this solution treats costs as positive.

For year 0 there is a payment for the original purchase of \$1M.

For years 1 through 15 there is an annualized payment for operation and maintenance of \$40K per year.

For year 15 there is a positive cash flow of \$300K for the salvage value which partially offsets the costs.

Since the O&M cost in years 1 through 15 is already annualized, there is no need for further manipulation.

The initial cost and the salvage value need to be transformed into annualized cash flows and added to the O&M. Use the **Factor Table** for 8% to look up the required cash flow factors. Solve for the EUAC.

$$EUAC = \$40,000 + \$1,000,000 (A/P, 8\%, 15) - \$300,000 (A/F, 8\%, 15)$$

$$EUAC = \$40,000 + \$116,800 - 11,040 = \$145,760$$

Answer C

46.4 A commercial tenant entering into a 17 year lease has the option to make a down payment to lower the monthly rent. Assuming a 6% interest rate, which option has the best present value?

- A. \$0 down, \$12,500/month
- B. \$250K down, \$10,000/month
- C. \$500K down, \$8,000/month
- D. \$1M down, \$5,000/month

Find the present value for each option. Use the $i = 6\%$ Factor Table to find P/A . The minimum present value is the best choice.

$$PV_1 = (12) (\$12,500) (P/A, 6\%, 17)$$

$$PV_1 = (12) (\$12,500) (10.4773) = \$1,571,595$$

$$PV_2 = \$250,000 + (12) (\$10,000) (P/A, 6\%, 17)$$

$$PV_2 = \$250,000 + (12) (\$10,000) (10.4773) = \$1,507,276$$

$$PV_3 = \$500,000 + (12) (\$8,000) (P/A, 6\%, 17)$$

$$PV_3 = \$500,000 + (12) (\$8,000) (10.4773) = \$1,505,821$$

$$PV_4 = \$1,000,000 + (12) (\$5,000) (P/A, 6\%, 17)$$

$$PV_4 = \$1,000,000 + (12) (\$5,000) (10.4773) = \$1,628,638$$

Answer C