

**ENGR 301/2**  
**Engineering Management Principles and Economics**  
**Final Exam Practice Questions**

1. At age 30 you invest \$5,000 into a mutual fund. If the fund averages an 8% annual return, your investment is worth how much at age 55?  
 (A) \$23,300 (B) \$34,240 (C) \$50,310 (D) \$344,570

$$n = 55 - 30 = 25$$

$$i = 8\%$$

$$P = \$5000$$

$$F = P(1+i)^n = \$5000(1+0.08)^{25} = \$34,242$$

2. You are saving up for a big investment in six years. You estimate it will take \$14,500 to secure this investment. How much do you need to put into a savings account at the end of each year if the savings account earns 4%? Neglect taxes.  
 (A) \$2,185 (B) \$2,375 (C) \$2,415 (D) \$2,485

$$F = \$14,500$$

$$A = ?$$

$$N = 6$$

$$i = 4\%$$

$$A = F(A/F, 6, 4\%) = \$14,500(0.1508) = \$2186.60$$

3. You are buying your first car and need to borrow \$16,000 over 5 years. If interest is 6%, what are your monthly payments?  
 (A) \$267 (B) \$309 (C) \$347 (D) \$389

$$P = \$16,000$$

$$N = 5 \text{ years} = 60 \text{ months}$$

$$i = 6\%, i_{\text{monthly}} = 6/12 = 0.5\%$$

$$A = ?$$

$$A = P(A/P, 60, 0.5\%) = \$16000(0.0193) = \$308.80$$

4. You are considering investing in a 5-yr CD (certificate of deposit) with an annual yield of 6.5% and monthly compounding. If you invest \$5,000, your effective interest earned is most nearly:  
 (A) 6.5% (B) 6.6% (C) 6.7% (D) 6.8%

$$\text{Annual rate} = 6.5\%$$

$$\text{Compounding frequency} = 12$$

$$\text{Therefore, effective interest rate} = i_a = (1 + r/m)^m - 1 = (1 + 0.065/12)^{12} - 1 = 6.7\%$$

5. A lift station sewage pump initially costs \$20,000. Annual maintenance costs are \$300. The pump salvage value is 10 percent of the initial cost in 20 years. Using 4% interest, the annual cost of the pump is most nearly:  
 (A) \$1,200 (B) \$1,705 (C) \$1,772 (D) \$1,840

*Initial cost = \$20,000*  
*Annual Maintenance Cost = \$300*  
*Salvage value after 20yrs = \$20,000 x 10% = \$2000*  
*i=4%*  
*EUAC=?*  
*Bring the salvage value to the present*  
 $2000(P/F, 4\%, 20) = \$2000(0.4564) = \$912.80$   
*Therefore, adjusted cost at time zero = \$20,000 - \$912.80 = \$19,087*  
*Convert \$19,087 to a uniform amount A over 20years and add it to \$300*  
 $\$19087(A/P, 4\%, 20) = \$19087(0.0736) = \$1404.80 + \$300 = \mathbf{\$1704.80}$

6. A computerized wood lathe, costing \$17,000, will be used to make ornamental parts for sale. Receipts are estimated at \$28,000 per year with costs running \$25,000 per year. The salvage value is \$2,000 at the end of 10 years. If the MARR is 8%, what is the present worth of this investment?  
 (A) -\$410 (B) \$3,130 (C) \$4,060 (D) \$5,210

*Initial cost = \$17,000*  
*Annual sales (benefit) = \$28,000*  
*Annual costs = \$25,000*  
*Salvage value at 10 years = \$2000*  
*PW=?*  
  
 $PW = -\$17,000 + \$28,000(P/A, 8\%, 10) - \$25,000(P/A, 8\%, 10) + \$2000(P/F, 8\%, 10)$   
 $= -\$17,000 + \$28,000(6.710) - \$25,000(6.710) + 2000(0.4632)$   
 $= \mathbf{\$4056}$

7. Two alternatives are available for producing logos on sport shirts. Costs are shown below. Interest is 4%.

	Machine A	Machine B
Initial Cost	\$54,000	\$74,000
Salvage Value	\$8,100	\$7,400
Operating Costs	\$2,100/yr	\$1,400/yr - 1st 10 years \$1,800/yr - 2 <sup>nd</sup> 10 years
Life	15 years	20 years

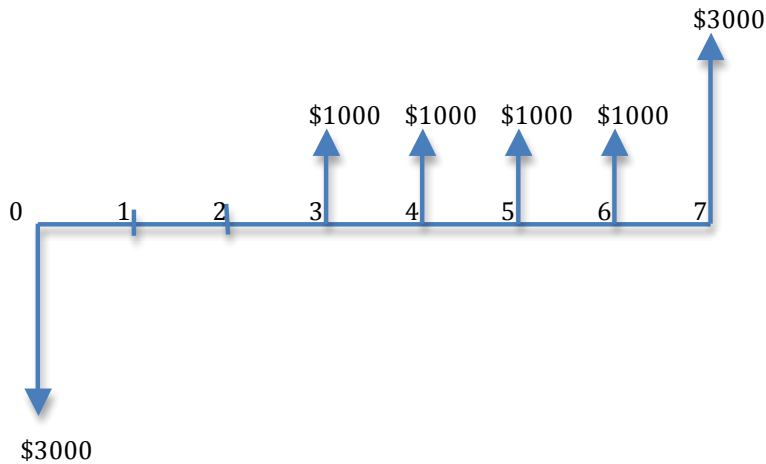
Q1: The annual cost for machine A (ACA) is: (A) \$6,350 (B) \$6,550 (C) \$6,750 (D) \$6,950

Q2: The annual cost for machine B (ACB) is: (A) \$6,360 (B) \$6,560 (C) \$6,760 (D) \$6,960

$$\text{Annual cost for machine A} = (\$54,000 - \$8100(P/F, 4\%, 15))(A/P, 4\%, 15) + \$2100 = \$6,550$$

$$\begin{aligned} \text{Annual cost for machine B} &= \\ &(\$74,000 - \$7,400(P/F, 4\%, 20))(A/P, 4\%, 20) + \\ &\quad [\$1400(P/A, 4\%, 10) + \$1800(P/A, 4\%, 10)(P/F, 4\%, 10)](A/P, 4\%, 20) \\ &= \$6,758 \end{aligned}$$

8. Determine the present worth of the following cash flow with  $i = 10\%$



$$\begin{aligned} PW &= -\$3000 + \$1000(P/A, 10\%, 4)(P/F, 10\%, 2) + \$3000(P/F, 10\%, 7) \\ &= -\$3000 + \$1000(3.170)(0.8264) + \$3000(0.5132) \\ &= \$1160 \end{aligned}$$

9. The equivalent single amount, at year five, to the given cash flow is close to:

$$\text{Equivalent single amount at year 5} = \$1160(F/P, 10\%, 5) = \$1160(1.611) = \$1868$$