Solutions

CADET _____ SECTION _____TIME OF DEPARTURE _____

DEPARTMENT OF CHEMISTRY

QUIZ 5 –CH402 2023-2024
10 Minutes, 24 Points
4 March 2024

TEXT: McCabe, Smith, and West
SCOPE: Engineering Economics

References Permitted: FE Reference Handbook

INSTRUCTIONS

1.Do not mark this quiz until "begin work" is given. You will have 10 minutes.
2. Solve the problems in the space provided. Show all work to receive credit.
3. There are 5 problems on 3 pages in this quiz, not including the cover page.
4. Write your name on the top of each sheet.
5. Show work to receive partial credit.

(TOTAL WEIGHT: 24 POINTS)

DO NOT WRITE IN THIS SPACE

PROBLEM	VALUE	CUT
1	6	1
2	6	c
3	6	a
4	6	c
CUT		
BONUS	6	a
GRADE	24	

Solution

1. What total amount of funds will be available 24 months from now after 21% taxes if $5,000 is invested at an annual interest rate of 6 percent compounded monthly?

(A) $6,805
(B) $7,430
(C) $5,636
(D) $5,502

$\$5{,}000\left(1+\frac{.06}{12}\right)^{2y} = \$5{,}635.8$

$(\$5{,}635.8 - \$5{,}000)(1-.21) = \$502.28$

$\$5{,}000 + \$502.28 = \underline{\$5{,}502.28}$
ANS

2. A proposed chemical plant will require a working-capital investment of $5 million. It is estimated that the working capital will be 21.0 percent of the total capital investment. If annual depreciation costs are estimated to be 10 percent of the fixed-capital investment, the annual depreciation (in millions of dollars) is most nearly

A) 1.3
B) 1.5
C) 1.9
D) 2.1

$\$5 \text{ million} = .21 \cdot TCI$

$TCI = \$23.8$ million

$FCI = \$23.8 \text{ million} - \$5 \text{ million}$
$= \$18.81$ million

$d = \$18.81 \cdot .10 = \underline{\$1.88 \text{ million}}$
ANS

Solution

3. Two pumps are being considered for pumping water from a reservoir. Installed cost and salvage value for the two pumps are given below:

	Pump A	Pump B
Installed cost	$15,250	$29,950
Salvage value	$3,300	$1,310

If the service life of Pump B is 5 years and the effective annual interest rate is 4%, what is the service life of Pump A at which the two pumps are competitive?

A) 2.0 years
B) 3.0 years
C) 4.0 years
D) 5.0 years

$(A/F, 4\%, 5) = .1846$

$$\$29,950 + \frac{(\$29,950 - \$1,310)\cdot .1846}{.04} = \$162,124$$

$$\$15,250 + (15,250 - 3,310)\cdot X = \$162,124$$

$$X = .4916$$

match $(A/F, 4\%, n) = .4916$ with table gives $n = 2$ — ANS

4. The fixed capital investment for an existing chemical plant is $20 million. Annual property taxes amount to 1% of the fixed-capital investment, and state income taxes are 5% of the gross earnings. The net income after all taxes is $2 million, and the federal income taxes amount to 25.7% of gross earnings. If the same plant had been constructed for the same fixed capital investment but at a location where property taxes were 6% of the fixed capital investment and the state income taxes were 2% of the gross earnings, what would be the net income per year after taxes, assuming all other cost factors were unchanged?

A) $1.50 million
B) $2.32 million
C) $1.10 million
D) $1.66 million

$$X - .257X - .01\cdot 20 - .05X = 2$$

$$X = 3.1746 \text{ million}$$

$$3.1746 - .257\cdot 3.1746 - .06\cdot 20 - .02\cdot 3.1746$$

$$= 1.095 \text{ million}$$

— ANS

Solution

Bonus – 6 Points

The following series of cash flows are projected for a proposed project:

Year End	0	1	2	3	4
Cash Flow	-$3,135	$1,000	$1,100	$1,200	$1,300

At 6% interest per year compounded annually, the *present* value of the project without taxes is most nearly

A) $825
B) $1,465
C) $3,900
D) $7,095

$(P/A, 6\%, 4) = 3.4651$

$(P/G, 6\%, 4) = 4.9455$

$-3135 + 1000 \cdot 3.4651 + 100 \cdot 4.9455$

$= \$824.65$

— Ans