

Answers for Midterm#1 and Credit Points Break-Down

Question #1 [10 points]

What elements are necessary for a valid and enforceable contract?

Offer

Acceptance (≈ Meeting of the minds, Agreements, etc.)

Consideration (≈ Payment plan, Exchange, etc.)

Legal Subject

Competence of the Parties

→ 4 answers out of 5 get full credit. 2.5 points for each.

Question #2 [10 points]

What is Fast-Tracking? Why would someone fast-track?

Definition

Fast-tracking is starting the construction phase at a point when only limited design work has been completed.

(For example, site grading and structure excavation begin when foundation design work is complete, but design work for all subsequent elements of the project, although in progress, is incomplete.)

→ 5 points

Why to Use and When to Use

This approach has the obvious advantage of shortening the overall delivery period for the completed facility. Since “time is money”, fast-track project delivery offers considerable potential savings to an owner. Therefore, someone would use fast-track when he wants to shorten the total project duration with possible saving.

→ 5 points

(Risks)

However, design changes after construction started may be very costly and time-consuming. This means less flexibility for owner to make changes. Coordinating design and construction entities can be much more difficult when they are separate entities.

Question #3 [20 points]

A contract was entered into for which an estimate of the project costs (exclusive of the contractor's profit) equal to \$22,425,000 was agreed to by the parties. The contractor's profit was agreed to be 6% of the estimated cost. The contract further provided that the owner would reimburse all the project costs to the contractor as they were expended and would pay the contractor's profit periodically as the work progressed. The contract further provided that the owner and contractor would share in any cost overruns or underruns, 60% to the owner and 40% to the contractor.

With respect to commercial terms, what kind of contract was this?

Cost Plus % Fee

Correct: Cost Reimbursable, Target Estimate, Cost + Incentive Fee

Not Correct: Lump Sum, Fixed Price, GMP, etc.

→ 4 points

If the total costs on project completion, exclusive of contractor's profit, had been \$24,975,000, how much would the owner have paid for the job?

Total amount that owner has to pay for the job:

Estimated Cost + 60% of the Overrun + 6% of the Estimated Cost

Overrun = $24,975,000 - 22,425,000 = 2,550,000$

Owner is responsible for 60% of the overrun

→ $2,550,000 * 0.6 = 1,530,000$

Owner also needs to pay the contractor's profit, 6% of the estimated cost, which is $22,425,000 * 0.06 = 1,345,500$

Total = $22,425,000 + 1,530,000 + 1,345,500 = \underline{\underline{\$25,300,500}}$

→ 8 points

Under the circumstances in (b), what would be the contractor's actual profit?

Contractor is responsible for the overrun by 40%;

$2,550,000 * 0.4 = 1,020,000$

Original Profit = $22,425,000 * 0.06 = 1,345,500$

**Actual Profit = Original Profit – 40% of Overrun
= $1,345,500 - 1,020,000 = \underline{\underline{\$325,500}}$**

→ 8 points

Question #4 [20 points]

One person, Andy, starts saving today for retirement. He saves \$3,000 per year for 10 years and then stops. Another person, Barbara, starts saving \$3,000 per year at age 35 and makes 30 payments. Both Andy and Barbara are 25 years old now. Who will have more money in present value terms? Interest rates are 8% and the investments occur at the beginning of each year.

Andy's Cash Flow

EMBED Visio.Drawing.11

$$PV = 3,000 + 3,000 (P/A, 8\%, 9) = 3,000 + 3,000 * 6.2469 = \underline{\underline{\$21,740}}$$

→ Cash Flow 3 points + Equation 7 points

Barbara's Cash Flow

EMBED Visio.Drawing.11

$$PV = 3,000 (P/A, 8\%, 39) - 3,000 (P/A, 8\%, 9)$$

$$\begin{aligned} & \text{OR} \\ & = 3,000 (P/A, 8\%, 40) - 3,000 (P/A, 8\%, 9) - 3,000 (P/F, 8\%, 40) \\ & = 3,000 * 11.9246 - 3,000 * 6.2469 - 3,000 * 0.0460 = \underline{\underline{\$16,895}} \end{aligned}$$

$$\begin{aligned} & \text{OR} \\ & = 3,000 (P/A, 8\%, 30) * (P/F, 8\%, 9) \\ & = 3,000 * 11.2578 * 0.5002 = \underline{\underline{16,893}} \end{aligned}$$

→ **Andy will have more money**

→ Cash Flow 3 points + Equation 7 points

→ Comparing FVs is fine as long as the equations are correct.

Question #5 [20 points]

A company considers installing new equipment as part of a production improvement program. There are three mutually exclusive alternatives and the relevant data are:

	A	B	C
Installation cost	\$1,000	\$800	\$500
Uniform annual benefit from the equip.	122	120	100
Salvage value	750	500	-100
Useful life (years)	10	10	10

If the minimum attractive rate of return is 8%, which alternative should be selected?

[Step 1]

Option A:

EMBED Visio.Drawing.11

$$NPV = 0 = -1,000 + 122 (P/A, i\%, 10) + 750 (P/F, i\%, 10)$$

Try $i = 8\%$;

$$NPV = -1,000 + 122 * 6.7101 + 750 * 0.4632 = 166 \rightarrow IRR > MARR \rightarrow \text{Viable}$$

Option

Option B:

EMBED Visio.Drawing.11

$$NPV = 0 = -800 + 120 (P/A, i\%, 10) + 500 (P/F, i\%, 10)$$

Try $i = 8\%$;

$$NPV = -800 + 120 * 6.7101 + 500 * 0.4632 = 236.8 \rightarrow IRR > MARR \rightarrow \text{Viable}$$

Option

Option C:

EMBED Visio.Drawing.11

$$NPV = 0 = -500 + 100 (P/A, i\%, 10) - 100 (P/F, i\%, 10)$$

Try $i = 8\%$;

$$NPV = -500 + 100 * 6.7101 - 100 * 0.4632 = 124.7 \rightarrow IRR > MARR \rightarrow \text{Viable}$$

Option

Step 1 → 6 points, 2 points per each option

[Step 2]

Initial Cost: $C < B < A$

B – C

Δ Cost = 300, Δ Annuity = 20, Δ Salvage = 600

NPV = 0 = -300 + 20 (P/A, i%, 10) + 600 (P/F, i%, 10)

Try i = 8%

NPV = -300 + 20 * 6.7101 + 600 * 0.4632 = \$112.1

IRR of "B to C" > MARR → B challenges C and won → **Choose Option B**

A – B

Δ Cost = 200, Δ Annuity = 2, Δ Salvage = 250

NPV = 0 = -200 + 2 (P/A, i%, 10) + 250 (P/F, i%, 10)

Try i = 8%

NPV = -200 + 2 * 6.7101 + 250 * 0.4632 = - \$70.8

IRR of "B to A" > MARR → A challenges B and lost → **Stick to Option B**

The Best Option is B

Step 2 → 14 points, 7 points per each comparison

Question #6 [20 points]

You are considering buying a government bond, which has the face value of \$5,000 and pays \$100 semi-annually for 10 years.

What are the nominal and effective interest rates of this government bond?

Cash Flow

EMBED Visio.Drawing.11

Nominal Interest Rate of the Bond:

The bond pays \$100 semi-annually so \$200 per year. The face value is \$5,000. Therefore, the rate of this bond is $200/5,000 = 0.04 = \underline{4\%}$

Effective Rate

$(1 + 0.04/2)^2 - 1 = 0.0404 = \underline{4.04\%}$

→ Nominal 5 points + Effective 5 points

You bought this bond. And after 7 years, the interest rates have increased by 2% over the original nominal rate. How much is the bond worth at the time 7?

Cash Flow

EMBED Visio.Drawing.11

The new interest rate is $4 + 2 = 6\%$

$$\begin{aligned} P_7 &= 100 (P/A, 3\%, 6) + 5,000 (P/F, 3\%, 6) \\ &= 100 * 5.417 + 5,000 * 0.8375 = \underline{\$4,729.5} \end{aligned}$$

→ As long as the right approach is used, that is, if correct portion was calculated using correct formula, full credit for it. → 10 points

→ If a reasonable assumption was made and correctly approached under that assumption, also full credit for it. → 10 points

→ Partial credit (between 5 and 10 points) will be given for solutions that are partially correct.

→ For a totally wrong approach and no answer at all, 5 points.