Solutions to EA-2(F) Examination
Fall, 2020

Question 1

The minimum required contribution is equal to the sum of the target normal cost and the amortization of the funding shortfall bases.

Smith has 4 years of service as of 1/1/2021, and so is non-vested under the 5 year cliff vesting schedule. No termination benefit would be paid if Smith should terminate in 2021, so only the non-termination benefit needs to be used for purposes of the target normal cost and funding target. Smith has an 80% probability of not terminating in 2021.

The target normal cost is equal to the present value of the current year accrual ($100 of monthly retirement benefit). At age 45 on 1/1/2021, Smith is exactly 20 years from retirement in this question (making the normal retirement date of 1/1/2041 the beginning of the 21st year from the valuation date), so the segment 3 interest rate of 5% is used to discount all benefits. The commutation functions used are found in the tables of supplementary factors provided with the examination, for a male participant using 5% interest. Note that it is assumed that there are no pre-retirement decrements, the normal form of benefit is a life annuity and normal retirement age is 65, per the general conditions of the exam.

$$\text{Target normal cost}_{1/1/2021} = 80\% \times \$100 \times 12 \times \frac{N_{65}^{(12)}}{D_{65}} \div 1.05^{20} = \$960 \times \frac{477{,}826}{38{,}972} \times 0.376889 = \$4{,}436$$

The funding target is equal to the present value of the 1/1/2021 accrued benefit. Smith has 4 years of past service, so the accrued benefit is $400 ($100 × 4 years). As with the target normal cost, only 80% of the accrued benefit is considered to account for the 20% probability of 2021 termination of employment.

$$\text{Funding target}_{1/1/2021} = 80\% \times \$400 \times 12 \times \frac{N_{65}^{(12)}}{D_{65}} \div 1.05^{20} = \$3{,}840 \times \frac{477{,}826}{38{,}972} \times 0.376889 = \$17{,}744$$

The funding shortfall is the excess of the funding target over the actuarial value of assets (reduced by the prefunding balance).

$$\text{Funding shortfall}_{1/1/2021} = \$17{,}744 - \$15{,}000 = \$2{,}744$$

The 2021 shortfall base is amortized over 7 years. The factor can be found in the table of selected amortization factors (for the segment rates 3%, 4%, 5%), provided with the exam.

Amortization of 2021 funding shortfall = $2,744/6.3293 = $434

$X = $4,436 + $434 = $4,870

Answer is B.

Question 2

The quarterly contribution requirement applies under IRC section 430(j)(3)(A) when the funding target attainment percentage (FTAP) in the prior year is less than 100% (meaning the plan had a funding shortfall in the prior year). The funding shortfall is equal to the funding target, reduced by the difference between the actuarial value of assets and the funding balances (prefunding balance, in this question).

The FTAP as of 1/1/2019 was 100%, so there was no quarterly contribution required for 2020. In addition the funding shortfall for 2019 would have been equal to $0, so any amortization bases at that time would have been fully amortized (IRC section 430(c)(6)).

1/1/2020 funding shortfall = $1,000,000 – ($900,000 – $50,000) = $150,000

Quarterly contributions are required for 2021 because there is a funding shortfall for 2020.

The amount of the quarterly contribution under IRC section 430(j)(3)(D) is equal to 25% of the smaller of 90% of the minimum required contribution for the current year or 100% of the minimum required contribution for the preceding year.

The minimum required contribution is equal to the sum of the target normal cost and the amortization of the funding shortfall bases. Note that the shortfall amortization bases are amortized over a period of 7 years, using the segment rates in effect as of the date the base is first amortized.

1/1/2020 minimum required contribution = $150,000 + ($150,000/6.2434) = $174,025

1/1/2021 funding shortfall = $1,201,750 – ($1,275,000 – $35,000) = ($38,250)

All shortfall amortization bases are fully amortized as of 1/1/2021 because the funding shortfall is $0 (actually less than $0) as of that date. The target normal cost for 2021 is reduced by the excess of the actuarial value of assets (reduced by the prefunding balance) over the funding target.

1/1/2021 minimum required contribution = $200,000 – $38,250 = $161,750

90% of the 1/1/2021 minimum required contribution = 90% × $161,750 = $145,575

The quarterly contribution due for each quarter of 2021 is equal to 25% of $145,575 (because 90% of the 2021 minimum required contribution is less than the 2020 minimum):

$X = 25% × $145,575 = $36,394

Answer is B.

Question 3

IRC section 430(j)(4)(E)(ii) defines the base amount as 3 times the adjusted disbursements made over the 12 month period ending on a given plan quarter. Adjusted disbursements as defined in IRC section 430(j)(4)(E)(iv) includes annuities purchased, multiplied by the plan's FTAP.

This statement is false for two reasons. First, the reduction for annuities purchased includes all annuities purchased during the past 12 months, not just during the given plan quarter. Second, the amount of those annuities is multiplied by the plan's FTAP.

Answer is B.

Question 4

The minimum required contribution under the Entry Age Normal cost method is equal to the normal cost plus the amortization charges of the various bases less the amortization credits of the various bases. This is brought forward using the valuation interest rate to the end of the year. The normal cost and accrued liability are determined on a tabular basis by participant, so that when a plan is amended to increase benefits, the normal cost and accrued liability are increased by the same percentage as benefits increase. In this question, all participants are active, so it is clear that the amendment applies to everyone.

The benefit multiplier has increased by 10%, from \$50 to \$55. As a result, the normal cost and accrued liability increase by 10%.

Valuation results as of 1/1/2021 (after reflecting amendment):

Normal cost = \$40,000 × 1.1 = \$44,000
Accrued liability = \$425,000 × 1.1 = \$467,500

A new amortization base is created and amortized over a period of 15 years (using the 6% valuation interest rate) due to the plan amendment, equal to the amount of the increase in the accrued liability (IRC section 431(b)(2)(B)(ii)).

New amortization base = \$467,500 – \$425,000 = \$42,500
Amortization charge = \$42,500/ $\ddot{a}_{\overline{15}|}$ = \$4,128

Minimum required contribution as of 12/31/2021 = (\$44,000 + \$5,000 + \$4,128) × 1.06 = \$56,316

The **smallest amount that satisfies the minimum funding standard** is equal to the minimum required contribution reduced by the credit balance.

\$X = \$56,316 – (\$26,475 × 1.06) = \$28,252

Answer is E.

Question 5

The minimum funding due date for all plans (single and multi-employer) is 8½ months after the end of the plan year (IRC section 431(c)(8)). Contributions must be made by that date in order to avoid an excise tax due to an accumulated funding deficiency.

For the 2021 plan year, the minimum funding due date is September 15, 2022. A contribution made on October 15, 2022 would not be sufficient to avoid an excise tax for failure to satisfy the minimum funding standard for 2021. The statement is false.

Answer is B.

Question 6

The 2020 contribution must be discounted using the 2020 plan effective rate of 6% from the date of contribution to 1/1/2020 in order to find the value as of the valuation date.

Discounted value of 2020 contribution = $\$15{,}000/1.06^{6/12} = \$14{,}569$

There is an excess contribution because the discounted value of the 2020 contribution exceeds the minimum required contribution.

2019 excess contribution = \$14,569 – \$9,000 = \$5,569

The general conditions of the exam state that the excess contribution is used as an addition to the prefunding balance.

In addition, the plan sponsor initially elected to use \$11,000 of the funding balances to help pay for the minimum required contribution for 2020. On 12/15/2020 this election was reduced to the minimum required contribution of \$9,000 (the election to revoke the use of part of the previously elected funding balance is allowed as it occurred no later than the end of the plan year). The \$9,000 must come first from the funding standard carryover balance, with the remaining \$4,000 coming from the prefunding balance. Note that the actual plan contribution already resulted in an excess contribution, so this additional \$9,000 is also now deemed to be an additional excess contribution to be added to the prefunding balance as of 1/1/2021.

Generally, excess contributions are increased with interest using the plan effective rate, and added to the prefunding balance on the first day of the following year (IRC section 430(f)(6)(B)). That is true for the \$5,569 excess contribution. However, the additional \$9,000 excess contribution that arose from the election to use the funding balances is increased with interest using the actual asset rate of return for 2020. In addition, the remaining 1/1/2020 prefunding balance of \$12,500 (\$16,500 – \$4,000) is increased with interest using the 2020 actual asset rate of return (see IRC section 430(f)(8)).

1/1/2021 prefunding balance = (\$12,500 × 0.95) + (\$5,569 × 1.06) + (\$9,000 × 0.95) = \$26,328

Answer is D.

Question 7

The minimum required contribution is equal to the target normal cost plus the amortization of the shortfall bases plus the amortization of any waived funding deficiencies.

The target normal cost is equal to the present value of benefits expected to accrue during the plan year, plus administrative expenses expected to be paid by the plan, less the present value of mandatory employee contributions expected to be paid during the year (IRC section 430(b)(1)). Note that in this question, the given administrative expenses are expected to be paid by the plan sponsor, so they are not included in the target normal cost.

Target normal $cost_{1/1/2021}$ = \$1,000 – \$150 = \$850

The funding shortfall is the excess of the funding target over the actuarial value of assets (reduced by the funding balances).

Funding $shortfall_{1/1/2021}$ = \$12,000 – \$10,000 = \$2,000

The 2021 shortfall base is equal to the funding shortfall less the sum of the outstanding balances of the prior shortfall bases and waived deficiency bases. There are no amortization charges for bases established before 2021, so there are no outstanding balances of prior bases. The 2021 funding shortfall is amortized over a period of 7 years. The factor can be found in the table of selected amortization factors (for the segment rates 5%, 6%, 7%), provided with the exam.

Amortization of 2021 funding shortfall = \$2,000/5.9982 = \$333

2021 **minimum required contribution** = \$850 + \$333 = \$1,183

Answer is A.

Question 8

Actuarial assumptions must reflect past experience of the plan, as well as expected future experience. In this plan, the past experience indicates that the average elected retirement age is age 61, and it is expected that this will continue in the future. There is a fully subsidized retirement benefit payable at that age, making the early retirement benefit more valuable than the normal retirement benefit. It would not be reasonable to continue to use age 65 as the assumed retirement age. The statement is false.

Answer is B.

Note: See the section dealing with retirement rates in chapter 5 of the study note "Assessment and Selection of Actuarial Assumptions."

Question 9

IRC sections 430(i)(4) and 430(i)(6) provide that a plan is considered to be at-risk if:

(1) The funding target attainment percentage (determined without using the additional at-risk funding assumptions) for the prior year is less than 80%,
(2) The funding target attainment percentage (determined using the additional at-risk funding assumptions) for the prior year is less than 70%, and
(3) The plan had more than 500 participants on at least one day of the prior year.

Prior to 2020, the funding target attainment percentage (FTAP) was always greater than 100%, so the plan was not at-risk in 2020 (or any prior year).

The 2020 FTAP (the FTAP is determined without regard to the at-risk assumptions) is 67%. This is less than the 80% threshold of condition (1), above. In addition, the FTAP for 2020 calculated using the at-risk assumptions, while not provided, must be less than or equal to 67% as the use of the at-risk assumptions can only serve to increase (or not change) the funding target, which is in the denominator of the FTAP ratio. As the denominator can only get larger, the ratio can only get smaller.

With the plan always having more than 500 participants, it is at-risk for 2021.

IRC section 430(i)(1)(C) requires a load on the at-risk funding target and target normal cost if the plan has been at-risk in at least two of the past 4 years. Since the plan is at-risk for the first time in 2021, there is no load.

IRC section 430(i)(5) provides for a transition to the at-risk year when a plan was not at-risk in the immediately prior year. The plan was not at-risk in 2020, so for 2021, the funding target and target normal cost are equal to 20% of the at-risk amounts plus 80% of the not at-risk amounts.

1/1/2021 target normal cost = (20% × $1,200,000) + (80% × $1,000,000) = $1,040,000

1/1/2021 funding target = (20% × $14,000,000) + (80% × $12,000,000) = $12,400,000

The funding shortfall is the excess of the funding target over the actuarial value of assets (reduced by the funding balances).

1/1/2021 funding shortfall = $12,400,000 – ($8,250,000 – $120,000) = $4,270,000

The 2021 shortfall base is equal to the funding shortfall less the outstanding balance of the prior shortfall base. There were no shortfall bases prior to 2020 because the FTAP prior to 2020 was always greater than 100%. The 2021 shortfall base is amortized over 7 years.

The outstanding balance of the 2020 shortfall amortization base as of 1/1/2021 can be determined using the 6-year amortization factor for 2021 (there are 6 years left to pay off the 2020 shortfall base).

Outstanding balance of 2020 shortfall base = $90,000 × 5.2932 = $476,388

2021 shortfall amortization base = $4,270,000 – $476,388 = $3,793,612

Amortization of 2021 shortfall base = $3,793,612/5.9982 = $632,458

The minimum required contribution is equal to the target normal cost plus the amortization of the shortfall bases.

1/1/2021 minimum required contribution = $1,040,000 + ($632,458 + $90,000) = $1,762,458

The **smallest amount that satisfies the minimum funding standard** is equal to the minimum required contribution, reduced by the funding balances to the extent that they can be elected to be used by the plan sponsor. IRC section 430(f)(3)(C) does not allow a plan sponsor to elect to use funding balances to pay for the minimum required contribution when the ratio of the actuarial value of assets (reduced by the prefunding balance) to the not at-risk funding target is less than 80% for the prior plan year. The FTAP as of 1/1/2020 is given to be 67%. This is less than the 80% threshold, so the prefunding balance cannot be used in 2021 to offset the minimum required contribution. Note that the actuarial value of assets in the 1/1/2020 FTAP was reduced by the prefunding balance, but not by a carryover balance since there was no carryover balance given in the question.

$X = $1,762,458

Answer is B.

Question 10

Under the projected unit credit cost method, the accrued liability is equal to the present value of the beginning of the year accrued benefit (using projected salary).

Smith is age 55 as of 1/1/2020, and the assumed retirement age is 65 (general conditions of the exam). The final 3-year average compensation, projected with the 3.5% per year assumed salary increases, is:

$$\$220{,}000 \times \frac{1.035^8 + 1.035^9 + 1.035^{10}}{3} = \frac{\$289{,}698 + \$299{,}837 + \$310{,}332}{3}$$

The salary for each year cannot exceed the IRC section 401(a)(17) salary limit for 2020 of $285,000. (Note that the salary limit cannot be projected to the year the salary is expected to be paid.) Each of the three projected salaries must be limited to $285,000 (you cannot project future compensation limits), making the final 3-year average equal to $285,000.

Smith has 12 years of service as of 1/1/2020.

1/1/2020 "projected" accrued benefit = 3% × $285,000 × 12 years of service = $102,600

For purposes of determining the accrued liability, the commutation functions used are found in the tables of supplementary factors provided with the examination, for a male participant using 6% interest. Note that the normal form of benefit is assumed to be a life annuity, per the exam general conditions. The general conditions also provide that unless otherwise stated, there are no assumed pre-retirement decrements.

$$\text{1/1/2020 accrued liability} = \$102{,}600 \times \frac{N_{65}^{(12)}}{D_{65}} \div 1.06^{10} = \$102{,}600 \times \frac{237{,}129}{21{,}046} \times 0.558395 = \$645{,}512$$

Answer is C.

Question 11

Treasury regulation 1.430(d)-1(f)(2) states that for a plan with fewer than 100 participants and beneficiaries not in pay status (that is, active and terminated vested participants, in this question), an assumption of no pre-retirement mortality can be used if reasonable. In this question there are a total of 56 participants not in pay status, so the use of a pre-retirement mortality assumption is not required. The statement is false.

Answer is B.

Question 12

The minimum required contribution under the Entry Age Normal cost method is equal to the normal cost plus the amortization charges of the various bases less the amortization credits of the various bases. All of the amortization bases in effect for the 2020 plan year have been provided, specifically the outstanding balance as of 1/1/2020 and the number of years remaining to amortize each base. For multiemployer plans, the amortization charge or credit does not change from year to year unless the assumed pre-retirement interest rate has changed, which it has not in this question. The amortization charges/credits for each of the bases that existed on 1/1/2020 are:

$$\text{Amortization of combined charge base} = \frac{\$1{,}200{,}000}{\ddot{a}_{\overline{10}|.065}} = \$156{,}738$$

$$\text{Amortization of experience gain} = \frac{(\$550{,}000)}{\ddot{a}_{\overline{12}|.065}} = (\$63{,}298)$$

$$\text{Amortization of experience loss} = \frac{\$420{,}000}{\ddot{a}_{\overline{14}|.065}} = \$43{,}751$$

The experience loss for 2020 is amortized over a period of 15 years as of 1/1/2021.

$$\text{1/1/2021 amortization of 2020 experience loss} = \frac{\$275{,}000}{\ddot{a}_{\overline{15}|.065}} = \$27{,}462$$

Finally, the increase in the accrued liability due to the plan amendment is generally amortized over a period of 15 years. However, under the rules of IRC section 431(b)(7)(G), when a plan amendment increases benefits payable not as a life annuity but over a period not to exceed 14 years, then the amortization period is equal to the period of time over which the benefits are paid. In this case the benefits are all payable to retirees as a one-time payment in 2021, so the amortization period would be 1 year rather than the usual 15 years. Therefore, the entire $110,000 liability increase would also be equal to the amortization charge associated with the increase.

In order to determine the **smallest amount that satisfies the minimum funding standard**, the credit balance must be subtracted from the normal cost plus amortization charges less amortization credits. This is determined as of the last day of the year, so all items must be given interest using the valuation interest rate (6.5% in this question).

$X = ($325,000 + $156,738 – $63,298 + $43,751 + $27,462 + $110,000 – $42,000) × 1.065= $593,900

Answer is C.

Question 13

The target normal cost is equal to the present value of the increase in the 2021 accrued benefit. Smith is age 40 on 1/1/2021, with 10 years of service.

Using the original 2020 compensation:

$$\text{1/1/2021 accrued benefit} = 1\% \times \frac{60{,}000 + 60{,}000 + 60{,}000}{3} \times 10 \text{ years of service} = \$6{,}000$$

$$\text{12/31/2021 accrued benefit} = 1\% \times \frac{60{,}000 + 60{,}000 + 60{,}000}{3} \times 11 \text{ years of service} = \$6{,}600$$

2021 increase = \$6,600 – \$6,000 = \$600

Using the corrected 2020 compensation:

$$\text{1/1/2021 accrued benefit} = 1\% \times \frac{60{,}000 + 60{,}000 + 70{,}000}{3} \times 10 \text{ years of service} = \$6{,}333.33$$

$$\text{12/31/2021 accrued benefit} = 1\% \times \frac{60{,}000 + 70{,}000 + 70{,}000}{3} \times 11 \text{ years of service} = \$7{,}333.33$$

2021 increase = \$7,333.33 – \$6,333.33 = \$1,000

The change in the accrued benefit to be used for the 2021 target normal cost is \$400 (\$1,000 – \$600).

Smith is more than 20 years from retirement in this question, so the segment 3 interest rate of 5% is used to discount all benefits. The commutation functions used are found in the tables of supplementary factors provided with the examination, for a <u>male</u> participant using 5% interest. Note that no pre-retirement decrements is assumed based upon the general conditions of the exam. In addition, the normal form of benefit is assumed to be a life annuity, per the general conditions.

The change in the 1/1/2021 target normal cost is:

$$\$X = \$400 \times \frac{N_{65}^{(12)}}{D_{65}} \div 1.05^{25} = \$400 \times \frac{477{,}826}{38{,}972} \times 0.295303 = \$1{,}448$$

Answer is C.

Question 14

The normal cost under the Aggregate cost method is equal to:

$$\frac{\text{Present value of future benefits - Actuarial value of assets (reduced by the credit balance)}}{\text{Temporary annuity}}$$

The general conditions of the exam state that unless you are told otherwise, there are no pre-retirement decrements. So an interest-only discount is used here. In addition, the general conditions provide that normal retirement age is 65, and the normal form of benefit is a life annuity.

Each of the 10 participants are currently age 55 as of the 1/1/2021 valuation date. There is a 2% annual salary increase assumption, so the final 3-year average salary for each of the participants is:

$$\text{Final 3-year average salary} = \$50{,}000 \times \frac{1.02^8 + 1.02^9 + 1.02^{10}}{3} = \$59{,}762$$

The commutation functions used are found in the tables of supplementary factors provided with the examination, for a male participant using 7% interest.

For the 10 participants:

$$\text{PVFB} = 10 \times 60\% \times \$59{,}762 \times \ddot{a}_{65}^{(12)} \times v^{10} = \$358{,}572 \times \frac{N_{65}^{(12)}}{D_{65}} \times 0.508349$$

$$= \$358{,}572 \times \frac{118{,}961}{11{,}432} \times 0.508349 = \$1{,}896{,}797$$

The temporary annuity is an annuity due for the 10 total years to retirement (from age 55 to 65). As there is a salary scale, the normal cost must increase as a percentage of salary. The temporary annuity factor must therefore incorporate both the 7% interest rate and the 2% salary scale, using an interest rate of:

i = 1.07/1.02 – 1 = 0.0490196, or 4.90196%

Temporary annuity factor = $\ddot{a}_{\overline{10}|4.90196\%}$ = 8.138956

The normal cost is:

$X = [PVFB – (AVA – CB)]/ $\ddot{a}_{\overline{10}|4.90196\%}$ = [\$1,896,797 – (\$150,000 – \$25,000)]/8.138956 = \$217,693

Answer is C.

Question 15

The average value method under IRC section 430(g)(3)(B), Treasury regulation 1.430(g)-1(c)(2), and Revenue Notice 2009-22 allows for averaging of fair market and adjusted fair market values for up to 25 months ending on the valuation date. The asset method being used in this question averages the fair market value on the valuation date with the adjusted fair market value from the prior two valuation dates.

The adjusted fair market value from a particular valuation date is the fair market value on that date, adjusted for all contributions, benefit payments and plan-related expenses that occurred between that valuation date and the current valuation date, and further adjusted for expected earnings based upon the actuary's best estimate of the asset rate of return for the year. If this expected rate of return is larger than the 3rd segment interest rate, then that 3rd segment interest rate is used. In this question, the assumed rate of return for 2020 of 8% is larger than the segment 3 rate for 2020, so the segment 3 rate of 6% is used to determine the expected earnings for 2020. For purposes of the expected earnings, the benefit payments and expenses are all paid mid-year, and only earn 6 months of interest. For 2020, the only contribution made that year is a contribution of $50,000 for the 2020 plan year, made on 7/1/2020, and it also earns 6 months of interest.

The expected earnings for 2020 are:

$$[350{,}000 \times .06] + [(50{,}000 - 30{,}000 - 2{,}000) \times (1.06^{6/12} - 1)] = 21{,}532$$

The discounted value of the $31,000 receivable contribution deposited on 6/1/2021, for the 2020 plan year, must be included in the 1/1/2021 asset value. The discount is based upon the 2020 plan effective rate of 5%.

Discounted receivable contribution for 2020 as of 1/1/2021 = $31{,}000/1.05^{5/12} = 30{,}376$

1/1/2021 adjusted market value of assets = 425,000 + 30,376 = 455,376

There is no information about the asset values during 2019 other than the given $50,000 asset gain. So, there is not enough information to follow the methodology of Revenue Notice 2009-22. However, this method is equivalent to the smoothed value method described in Revenue Procedure 2000-40. Under that method (with 3 years of smoothing – 2019 through 2021 in this case), the actuarial value of assets is equal to the market value of assets as of the valuation date, plus (minus) 2/3 of the prior year asset loss (gain), plus (minus) 1/3 of the second prior year asset loss (gain).

The 2020 asset gain or loss must be determined.

2020 actual earnings = 425,000 – (350,000 + 50,000 – 30,000 – 2,000) = 57,000

2020 asset gain = actual earnings – expected earnings = 57,000 – 21,532 = 35,468

Smoothed value as of 1/1/2021 = 455,376 – (⅔ × 35,468) – (⅓ × 50,000) = 415,064

Under IRC section 430(g)(3)(B)(iii), the actuarial value of assets cannot be less than 90% of the market value of the assets (including receivable contributions). 90% of 455,376 is equal to 409,838. This does not affect the calculated actuarial value.

The 1/1/2021 actuarial value of assets is equal to 415,064.

Answer is B.

Question 16

IRC section 432(b)(1) provides that a multiemployer plan is in endangered status if it is not in critical status (or critical and declining status) and if at least one of the following conditions apply:

(1) The funded percentage of the plan as of the first day of the plan year is less than 80%.
(2) The plan has a funding deficiency in the current plan year or is expected to have a funding deficiency in any of the next 6 plan years.

The funded percentage is the ratio of the actuarial value of assets to the unit credit accrued liability. The plan is considered to be seriously endangered if both of the conditions apply.

1/1/2021 funded percentage = 684,000/1,000,000 = 68.4%

The plan is seriously endangered in 2021 because the funded percentage is less than 80% and it is expected to have a funding deficiency in the 6^{th} year after the current year (2027).

IRC section 432(c)(3)(B) provides that under the terms of a funding improvement plan, the funded percentage must be increased by at least 20% of the difference between 100% and the funded percentage as of the beginning of the first plan year in which the plan is considered to be seriously endangered.

X% = 68.4% + [20% × (100% - 68.4%)] = 74.7%

Answer is D.

Question 17

Treasury regulation 1.430(d)-1(d)(1)(i) provides that any plan amendment adopted by the valuation date must be taken into account in determining the target normal cost provided the amendment is effective before the close of the plan year. In the case of the amendment in this question, it was adopted before the valuation date (actually, during the prior plan year), and is effective on 5/1/2021, before the close of the 2021 plan year. Therefore, it must be reflected in the determination of the 2021 target normal cost. The statement is true.

Answer is A.

Question 18

IRC section 436(f)(3) provides for a required reduction in the funding balances to the extent the reduction would prevent any restriction on accelerated distributions under IRC section 436(d). The thresholds for preventing a restriction on accelerated distributions are an adjusted funding target attainment percentage (AFTAP) of less than 60% for a full restriction, or less than 80% for a partial restriction.

$$\text{AFTAP} = \frac{\text{Actuarial value of assets - Funding balances}}{\text{Funding target}} = \frac{2{,}750{,}000 - 300{,}000 - 600{,}000}{3{,}200{,}000} = 57.8\%$$

Note that the numerator and denominator technically are each increased by amounts used to purchase annuities during the past two years for NHCEs. There are no annuities purchased in this question.

In order to reach the 80% threshold, the numerator of the AFTAP would need to be increased to 2,560,000 (3,200,000 × 80%). That means that the funding standard carryover balance would be reduced to zero, and the prefunding balance would be reduced to 190,000. (Note that the funding standard carryover balance must be reduced to zero before the prefunding balance can be reduced.)

$X = $190,000

Answer is B.

Question 19

The minimum required contribution under the Entry Age Normal cost method is equal to the normal cost plus the amortization charges of the various bases less the amortization credits of the various bases. All of the amortization bases in effect for the 2021 plan year (and established before 2021) have been provided, specifically the outstanding balance as of 1/1/2021 and the number of years remaining to amortize each base. For multiemployer plans, the amortization charge or credit does not change from year to year unless the assumed pre-retirement interest rate has change, which it has not in this question. The amortization charges/credits for each of the bases that existed on 1/1/2021 are:

Amortization of plan amendment base = $\frac{\$1{,}200{,}000}{\ddot{a}_{\overline{11}|.06}} = \$143{,}539$

Amortization of experience gain = $\frac{(\$900{,}000)}{\ddot{a}_{\overline{13}|.06}} = (\$95{,}910)$

Amortization of experience loss = $\frac{\$600{,}000}{\ddot{a}_{\overline{14}|.06}} = \$60{,}897$

The experience loss for 2020 is amortized over a period of 15 years as of 1/1/2021.

1/1/2021 amortization of 2020 experience loss = $\frac{\$50{,}000}{\ddot{a}_{\overline{15}|.06}} = \$4{,}857$

In order to determine the **smallest amount that satisfies the minimum funding standard**, the credit balance must be subtracted from the normal cost plus amortization charges less amortization credits. This is determined as of the last day of the year, so all items must be given interest using the valuation interest rate (6% in this question).

$X = (\$600{,}000 + \$143{,}539 – \$95{,}910 + \$60{,}897 + \$4{,}857 – \$50{,}000) × 1.06= \$703{,}186

Answer is C.

Question 20

IRC section 404(a)(1)(A) provides that, in general, the deductible limit for a multiemployer defined benefit plan is equal to the greater of the minimum required contribution or the sum of the normal cost and the 10-year amortization of the unfunded liabilities (amortization bases). These amounts are generally determined as of the end of the plan year, as required in this question. The results from the 1/1/2021 valuation date are brought forward with interest using the valuation interest rate to 12/31/2021.

12/31/2021 minimum required contribution = $3,750,000 × 1.06 = $3,975,000

12/31/2021 normal cost plus 10-year amortization of bases

= ($2,100,000 + $300,000) × 1.06 = $2,544,000

In addition, IRC section 404(a)(1)(D) provides that the deductible limit is equal to 140% of RPA'94 current liability less the actuarial value of assets (also determined at the end of the plan year), if that is larger than the amount determined under IRC section 404(a)(1)(A). The valuation results are brought forward with interest. However, the current liability is determined using the current liability interest rate, so that is adjusted using the current liability interest rate, not the valuation interest rate. The actuarial value of assets is adjusted using the valuation interest rate. The RPA'94 current liability must also be increased by the expected increase in current liability during 2021 due to additional accruals (this is similar to the normal cost piece). Finally, both the current liability and the actuarial value of assets must be adjusted to reflect the expected benefit payments during the year (in the case of the current liability, this is the expected release from RPA'94 current liability).

140% of RPA'94 current liability less actuarial value of assets as of 12/31/2021

= [1.4 × ($20,000,000 + $2,500,000 – $270,000) × 1.04] – [(14,700,000 – $260,000) × 1.06]
= $32,366,880 – $15,306,400 = $17,060,480

$X = $17,060,480

Answer is B.

Note: The deductible limit under IRC section 404(a)(1)(A) is limited by the full funding limitation as described in Treasury regulation 1.404(a)-14(k). This was not considered in the solution because the deduction allowed under IRC section 404(a)(1)(D) is larger than the deduction allowed under IRC section 404(a)(1)(A), so any further limitation under IRC section 404(a)(1)(A) would not affect the final answer. Note that the deductible limit under IRC section 404(a)(1)(D) is not limited by the full funding limit (the regulation was written prior to the addition of IRC section 404(a)(1)(D) to the Internal Revenue Code).

Question 21

The minimum required contribution is equal to the target normal cost plus the amortization of the shortfall bases plus the amortization of any waived funding deficiencies.

The funding shortfall is the excess of the funding target over the actuarial value of assets (reduced by the funding balances).

Funding shortfall$_{1/1/2021}$ = \$1,200,000 – (\$1,300,000 – \$60,000) = \$0

The funding shortfall cannot be less than \$0. When the funding shortfall is zero, there is no new shortfall amortization base, and the prior year shortfall bases are deemed to be fully amortized (IRC section 430(c)(6)).

In addition, the excess of the actuarial value of assets (reduced by the funding balances) over the funding target is a credit used to reduce the target normal cost (IRC section 430(a)(2)).

2021 **minimum required contribution** = \$200,000 – [(\$1,300,000 – \$60,000) – \$1,200,000]
= \$160,000

Answer is D.

Question 22

IRC section 430(h)(2)(C)(iv) provides rules with regard to the stabilization of the segment interest rates. In particular, for 2021, the 24-month average segment interest rates cannot be less than 85% or more than 115% of the 25-year average segment rates.

Considering the first segment rate for 2021, 85% of the 25-year average rate is 2.975% (85% of 3.5%) and 115% of the 25-year average rate is 4.025% (115% of 3.5%). The 24-month average segment rate is 2.7%, so this must be increased to 2.975% so that it is not outside of the range.

X% = 2.975%

Answer is D.

Question 23

The 2021 contribution must be discounted using the 2021 plan effective rate of 4% from the date of contribution to 1/1/2021 in order to find the value as of the valuation date.

Discounted value of 2021 contribution = $\$590{,}000/1.04^{3.5/12} = \$583{,}289$

There is an excess contribution because the discounted value of the 2021 contribution exceeds the minimum required contribution.

2021 excess contribution = $\$583{,}289 - \$500{,}000 = \$83{,}289$

The general conditions of the exam state that the excess contribution is used as an addition to the prefunding balance.

Excess contributions are increased with interest using the plan effective rate, and added to the prefunding balance on the first day of the following year (IRC section 430(f)(6)(B)). In addition, the unused prefunding balance is increased with interest using the 2021 actual asset rate of return (see IRC section 430(f)(8)).

1/1/2022 prefunding balance = ($\$200{,}000 \times 1.17$) + ($\$83{,}289 \times 1.04$) = $\$320{,}621$

Answer is D.

Question 24

IRC section 412(c)(5)(A) provides that an application for a waiver of minimum funding for a single employer plan must be made no later than 2½ months after the plan year end. For the plan year beginning on 1/1/2021, that would be 3/15/2022. The statement is true.

Answer is A.

Question 25

The **smallest amount that satisfies the minimum funding standard** is equal to the minimum required contribution, less the amount of the funding balances elected to be used to offset the minimum.

In this question, there are two elections made with regard to the prefunding balance. In general, the elections are applied in the chronological order in which they occur. The first election, made on 1/1/2022, reduces the prefunding balance on 1/1/2022 by $80,000. In order to do this, the prefunding balance as of 1/1/2021 must be interest adjusted to 1/1/2022 (no elections were made to adjust the prefunding balance during 2021). The prefunding balance is increased with interest using the 2021 actual asset rate of return (see IRC section 430(f)(8)).

1/1/2022 prefunding balance (before reduction) = $100,000 × 1.11 = $111,000
1/1/2022 prefunding balance (after reduction) = $111,000 – $80,000 = $31,000

On 9/15/2022, the plan sponsor elects to apply the remaining prefunding balance to the 2021 minimum required contribution. The balance of the minimum required contribution will be paid as a contribution on 9/15/2022. The remaining prefunding balance must be interest adjusted (using the 2021 asset rate of return) back to 1/1/2021.

1/1/2021 prefunding balance (after reduction) = $31,000/1.11 = $27,928

$X = ($200,000 – $27,928) × $1.05^{20.5/12}$ = $187,029

Answer is C.

Question 26

IRC section 4971(a)(2) provides that the initial excise tax upon failure of a multiemployer plan to satisfy the minimum funding standard is 5% of the funding deficiency as of the end of the plan year. The statement is true.

Answer is A.

Question 27

The funding target is equal to the present value of the benefit accrued as of the first day of the year. Smith is age 44 on 1/1/2021, with 10 years of service.

1/1/2021 accrued benefit = \$25 × 10 years of service = \$250

For purposes of the assumed retirement age of 63, the accrued benefit is reduced by 10% for each year that retirement precedes age 65 (two years for a total 20% reduction).

1/1/2021 accrued benefit payable at age 63 = \$250 × 80% = \$200

The rate of retirement at each age is:

63: 20%
65: 80%

The funding target using the retirement assumptions is equal to the sum of the product of the funding target based on each possible retirement age and the probability of retiring of that age. Smith is more than 20 years from retirement if retirement occurs at age 65, so the segment 3 interest rate of 7% is used to discount all benefits. However, for the possible retirement age of 63, Smith is 19 years from retirement. The segment 2 interest rate of 6% would be used to discount the benefits payable between ages 63 and 64, with the segment 3 interest rate used for all additional payments. The commutation functions used are found in the tables of supplementary factors provided with the examination, for a male participant using 6% and 7% interest. Note that no pre-retirement decrements are assumed, so there is an interest-only discount prior to the assumed retirement age. In addition, the normal form of benefit is assumed to be a life annuity, per the general conditions of the exam.

$$\$X = \text{2021 funding target} = \left(20\% \times \$200 \times 12 \times \left[\frac{N^{(12)}_{63@6\%} - N^{(12)}_{64@6\%}}{D_{63@6\%}} v^{19}_{6\%} + \frac{N^{(12)}_{64@7\%}}{D_{63@7\%}} v^{19}_{7\%}\right]\right)$$

$$+ \left(80\% \times \$250 \times 12 \times \frac{N^{(12)}_{65}}{D_{65}} \div 1.07^{21}\right)$$

$$= \left(20\% \times \$2{,}400 \times \left[\frac{282{,}284 - 258{,}960}{24{,}024}(0.330513) + \frac{130{,}881}{13{,}296}(0.276508)\right]\right)$$

$$+ \left(80\% \times \$3{,}000 \times \frac{118{,}961}{11{,}432} \times 0.241513\right)$$

$$= \$1{,}461 + \$6{,}032 = \$7{,}493$$

Answer is D.

Question 28

IRC section 430(b)(1) defines the target normal cost as the excess of the sum of the present value of benefits expected to accrue during the year and the plan related expenses expected to be paid by the plan for the year, over the present value of the mandatory employee contributions expected to be contributed for the year.

2021 target normal cost = ($4,000 + $2,000) – $8,000 = $0

Note that the target normal cost cannot be less than $0.

The minimum required contribution under IRC section 430(a)(1) is equal to the sum of the target normal cost, the shortfall amortization charges, and the waiver amortization charges.

2021 minimum required contribution = $0 + $12,000 = $12,000

The statement is false.

Answer is B.

Question 29

When the plan sponsor elects to use part of a funding balance to satisfy a quarterly contribution requirement, the amount elected is discounted from the date of the election to the first day of the plan year using the current year plan effective rate to determine the amount used to reduce the funding balance (note that funding balances are always maintained as of the first day of the plan year). In this question, the plan sponsor elects on 7/1/2021 to use $225,000 of the funding standard carryover balance to pay for the $225,000 quarterly contribution that was due on 4/15/2021.

$X = Reduction to 1/1/2021 carryover balance = $225,000/$1.06^{6/12}$ = $218,539

Answer is C.

Note: When the plan sponsor elects to use the carryover balance to pay for a quarterly contribution, it is also used to pay for the minimum required contribution. However, for purposes of using it to pay for the minimum required contribution, it is necessary to consider that the election to use the carryover balance was made late (after 4/15/2021). In that case, when discounting it back to the 1/1/2021 valuation date, it must be discounted using an interest rate of the plan effective rate plus an additional 5 percentage points (for a total 11% rate) for the 2½ months that the election was made late (and then discounted using the 6% plan effective rate for the remaining period). So, for purposes of determining the value of the carryover balance that can be used to pay for part of the minimum required contribution, that amount is:

$225,000/[$(1.11^{2.5/12})(1.06^{3.5/12})$] = $216,451

That is <u>not</u> the amount being asked for in this question, but it is important to understand the difference between the correct solution and this alternative method of discounting, which is the amount used to offset the minimum required contribution.

Question 30

The deductible limit for a single employer plan under IRC section 404(o)(2)(A) is equal to the sum of the funding target, the target normal cost, and the cushion amount, with the sum being reduced by the actuarial value of assets. The cushion amount under IRC section 404(o)(3)(A) is equal to the sum of 50% of the funding target plus the increase in the funding target if future compensation increases were taken into account. The plan is not at-risk (general conditions of the exam).

Cushion amount = (50% × 880,000) + (940,000 – 880,000) = 500,000

The IRC section 404(o)(2)(A) deductible limit is:

15,000 + 880,000 + 500,000 – 800,000 = 595,000

For plans that are not at-risk, the deductible limit can be determined under IRC section 404(o)(2)(B), if that gives a larger result than the deductible limit under IRC section 404(o)(2)(A). The deductible limit under IRC section 404(o)(2)(B) is equal to the sum of the funding target and target normal cost, if each were determined as if the plan was at-risk, with the sum being reduced by the actuarial value of assets.

The IRC section 404(o)(2)(B) deductible limit is:

20,000 + 970,000 – 800,000 = 190,000

The deductible limit is the larger of the IRC section 404(o)(2)(A) and 404(o)(2)(B) limits, which is 595,000.

Answer is D.

Note: Without regulations for IRC section 404(o), it is unclear as to whether the deductible limit is determined as of the valuation date, or as of the close of the employer's fiscal year (which has traditionally been when the deductible limit is determined). In this question, if 595,000 is increased using the 5.5% effective interest rate to 12/31/2021, the result is 627,725. This is in the same answer range. Also note that the minimum required contribution of 155,000 is provided. If the minimum required contribution is larger than the otherwise deductible limit, then the minimum required contribution could be deducted. That is not the case in this question.

Question 31

The automatic extension period under IRC section 431(d)(1) provides for an extension of 5 years for each charge base that is part of the approved extension. There is an alternative extension of 10 years under IRC section 431(d)(2), but this is not an automatic extension.

The statement is false.

Answer is B.

Question 32

The minimum required contribution under the Entry Age Normal cost method is equal to the normal cost plus the amortization charges of the various bases less the amortization credits of the various bases. In order to determine the **smallest amount that satisfies the minimum funding standard**, the credit balance must be subtracted from the normal cost plus amortization charges less amortization credits. This is determined as of the last day of the year, so all items must be given interest using the valuation interest rate (7.5% in this question).

$X = ($20,000 + $90,000 – $40,000 – $30,000) × 1.075= $43,000

The minimum required contribution under the Aggregate cost method is equal to the normal cost. There are no amortization bases using this cost method. The normal cost using the Aggregate cost method is equal to:

$$\frac{\text{Present value of future benefits - Actuarial value of assets (reduced by the credit balance)}}{\text{Temporary annuity}}$$

When the benefits are determined as a percentage of salary, the temporary annuity is equal to the ratio of the present value of future salary to the present value of current year salary (general conditions of the exam).

$$\text{1/1/2021 Aggregate normal cost} = \frac{\$2{,}400{,}000 - (\$1{,}580{,}000 - \$30{,}000)}{\$4{,}500{,}000 / \$450{,}000} = \$85{,}000$$

In order to determine the **smallest amount that satisfies the minimum funding standard**, the credit balance must be subtracted from the normal cost, with the difference increased with interest to the end of the year.

$Y = ($85,000 – $30,000) × 1.075 = $59,125

$Y – $X = $59,125 – $43,000 = $16,125

Answer is B.

Question 33

IRC sections 430(i)(4) and 430(i)(6) provide that a plan is considered to be at-risk if:

(1) The funding target attainment percentage (determined without usng the additional at-risk funding assumptions) for the prior year is less than 80%,
(2) The funding target attainment percentage (determined usng the additional at-risk funding assumptions) for the prior year is less than 70%, and
(3) The plan had more than 500 participants on at least one day of the prior year (all participants from all plans within the controlled group must be included in the participant count).

The 2020 FTAP (without regard to the additional at-risk funding assumptions) for plan A is 75%, so condition (1) is satisfied (75% is less than 80%).

The 2020 FTAP (using the additional at-risk funding assumptions) for plan A is 67%, so condition (2) is satisfied (67% is less than 70%).

Plan B has always had more than 400 participants, and Plan A has 150 participants on each day of 2020, so the aggregated plan within the controlled group had more than 550 participants in 2020. Condition (3) is satisfied.

Plan A is at-risk for 2021. The statement is true.

Answer is A.

Question 34

The funding target is equal to the present value of the benefit accrued as of the first day of the year. Smith is age 45 as of 1/1/2021, 20 years from the normal retirement age of 65 (per the general conditions of the exam), so only the segment 3 interest rate is used to discount benefits. Note that the discount for years prior to normal retirement age is based on interest only because there is no mention of any preretirement decrements (the general conditions for the exam state that there are no preretirement decrements).

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Treasury regulation 1.430(d)-1(f)(4)(ii)(B) requires that for funding purposes, a lump sum must be valued using the 417(e) mortality (post-retirement) and using the funding segment rates. In addition, regulation 1.430(d)-1(f)(4)(iii)(D) provides that when the plan equivalence for determining the lump sum value (at retirement age) exceeds the lump sum value (at retirement age) using 417(e) applicable interest and mortality, then the lump sum is valued using the applicable mortality table for post-retirement mortality, and the plan interest rate for post-retirement interest. The funding segment rates are always used to discount prior to retirement age.

In this question, the plan equivalence for determining the lump sum is based upon 417(e) applicable interest rates, so the funding segment 3 interest rate of 7% is used both pre and post retirement, and the 417(e) applicable mortality table is used for post retirement mortality.

Funding target for assumed lump sum election = $80\% \times \$2{,}500 \times 12 \times 10.658 \times v^{20} = \$66{,}102$

The commutation functions used are found in the tables of supplementary factors provided with the examination, for a female participant using 7% interest.

$$\begin{aligned}\text{Funding target for assumed life annuity election} &= 20\% \times \$2{,}500 \times 12 \times \frac{N_{65}^{(12)}}{D_{65}} \div 1.07^{20} \\ &= 20\% \times \$30{,}000 \times (128{,}063/11{,}739) \times 0.258419 \\ &= \$16{,}915\end{aligned}$$

$X = \$66{,}102 + \$16{,}915 = \$83{,}017$

Answer is B.

Question 35

Treasury regulation 1.430(d)-1(d)(1)(i) provides that any plan amendment adopted by the valuation date must be taken into account in determining the target normal cost and funding target provided the amendment is effective before the close of the plan year. In the case of the amendment in this question, it was adopted before the valuation date (actually, during the prior plan year), and is effective in 2 parts. The first increase in the benefit multiplier is effective on 1/1/2021, before the close of the 2021 plan year. The second increase in the benefit multiplier is effective on 1/1/2023, after the close of the 2021 plan year. Only the increase in the multiplier to $55 per year of service is reflected in the determination of the 2021 target normal cost and funding target for 2021.

The minimum required contribution is equal to the target normal cost plus the amortization of the shortfall bases plus the amortization of any waived funding deficiencies.

The target normal cost and funding target are given before reflecting any plan amendment. They must each be increased by a factor of 55/50 to reflect the increase in the multiplier that became effective on 1/1/2021.

Target normal $cost_{1/1/2021}$ = $90,000 × (55/50) = $99,000
Funding $target_{1/1/2021}$ = $1,000,000 × (55/50) = $1,100,000

The funding shortfall is the excess of the funding target over the actuarial value of assets (reduced by the funding balances).

Funding $shortfall_{1/1/2021}$ = $1,100,000 – ($1,060,000 – $100,000) = $140,000

The 2021 shortfall amortization base is equal to the funding shortfall less the sum of the outstanding balances of the prior shortfall bases. No shortfall amortization bases were established before 2021, so there are no outstanding balances of prior bases. The 2021 funding shortfall is amortized over a period of 7 years. The factor can be found in the table of selected amortization factors (for the segment rates 5%, 6%, 7%), provided with the exam.

Amortization of 2021 funding shortfall = $140,000/5.9982 = $23,340

2021 minimum required contribution = $99,000 + $23,340 = $122,340

The **smallest amount that satisfies the minimum funding standard** for 2021 is equal to the minimum required contribution less the prefunding balance.

$X = $122,340 – $100,000 = $22,340

Answer is B.

Question 36

Treasury regulation 1.430(d)-1(c)(1)(ii)(D) provides rules with regard to the allocation of benefits that are not earned based upon years of service, such as a portion of the preretirement death benefit in this question. The regulation says that "the portion of a participant's benefit that is taken into account in determining the funding target for a plan year is equal to the total benefit multiplied by the ratio of the participant's years of service as of the first day of the plan year to the years of service the participant will have at the time of the event that causes the benefit to be payable." Specifically, the death benefit (to the extent it is not earned based on years of service) is allocated based on proportional years of service with the employer. Smith has 25 years of past service as of the first day of the 2021 plan year. For purposes of the funding target, Smith would have 30 years of service at age 60 on 1/1/2026, which is the date of death that the question is asking about. If Smith dies on that date, 25/30 of the death benefit payable at that time will have been earned as of 1/1/2021.

The annual accrued benefit for Smith as of 1/1/2021 is:

2.5% × $140,000 × 20 years of service = $70,000

Note that service for this benefit has been limited to 20 years, and this would also be the normal retirement benefit as no additional service credits are used for the benefit payable at retirement.

The preretirement death benefit is equal to the greater of two times the normal retirement benefit (2 × $70,000 = $140,000) and $300,000. For Smith, that would be $300,000. The portion of that $300,000 in excess of twice the annual accrued benefit must be allocated proportionally to past service in order to determine the death benefit to be used for the funding target. (Note that $140,000 of the death benefit is specifically attributable to past service, as it is a multiple of the accrued benefit which is based upon years of service – it is only the additional death benefit in excess of the service related accrued benefit that must be earned proportionally to service as of 1/1/2021 and service at age 60.)

Excess death benefit = $300,000 – $140,000 = $160,000

Note that for purposes of the funding target, assumed future salary increases are not taken into account.

Allocable excess death benefit at age 60 on 1/1/2021 = $160,000 × (25/30) = $133,333

In order to find the probability of death at age 60, it will be necessary to determine the probability of survival from age 55 to age 60. As the death benefit is payable 5 years from the valuation date, which is the first day of the 6^{th} year from 1/1/2021, the segment 2 interest rate of 6% is used. The commutation functions used are found in the tables of supplementary factors provided with the examination, for a male participant using 6% interest.

Recall from life contingencies that $D_{60}/D_{55} = v^5 \, {}_5p_{55}$.

Therefore using the commutation functions in the table and a 6% interest rate,

$29{,}119/39{,}644 = v^5 \, {}_5p_{55} \quad \rightarrow \quad 0.734512 = 0.747258 \times {}_5p_{55} \quad \rightarrow \quad {}_5p_{55} = 0.982943$

The funding target for Smith attributable to the death benefit payable at age 60, valued using the segment 2 interest rate of 6%, is:

$\$X = (\$140{,}000 + \$133{,}333) \times v^5 \times {}_5p_{55} \times q_{60} = \$273{,}333 \times 0.747258 \times 0.982943 \times 0.005087 = \$1{,}021$

Answer is C.

Question 37

Smith is 60 years old with 20 years of service as of the 1/1/2021 valuation date. The service requirement in order to receive the disability benefit is 10 years, so the disability benefit would be paid at the Smith's current age 60.

The disability benefit is equal to the projected normal retirement benefit using projected service (Smith would have an additional 5 years of service) and based on final compensation (2020 compensation) rather than the final 3-year average compensation.

Disability benefit = 1% × \$51,000 × 25 years of service = \$12,750

The segment 1 interest rate of 5% is used to discount retirement benefits paid from age 60 through age 65, the segment 2 interest rate of 6% is used to discount retirement benefits paid from age 65 through age 80, and the segment 3 interest rate of 7% is used to discount benefits paid at age 80 and later. The commutation functions used are found in the tables of supplementary factors provided with the examination, for a <u>male</u> participant using 5%, 6%, and 7% interest.

$$\begin{aligned}\text{Funding target} &= \$12{,}750 \times \left[\frac{N^{(12)}_{60@5\%} - N^{(12)}_{65@5\%}}{D_{60@5\%}} + \frac{N^{(12)}_{65@6\%} - N^{(12)}_{80@6\%}}{D_{60@6\%}} + \frac{N^{(12)}_{80@7\%}}{D_{60@7\%}}\right] \\ &= \$12{,}750 \times \left[\frac{703{,}318 - 477{,}826}{51{,}424} + \frac{237{,}129 - 44{,}316}{29{,}119} + \frac{19{,}930}{16{,}577}\right] \\ &= \$155{,}662\end{aligned}$$

\$X = \$155,662 – \$80,890 = \$74,772

Answer is D.

Question 38

Multiemployer plans that provide a pre-retirement death benefit funded through insurance contracts can either provide for the funding either by split funding or envelope funding. If the split funding method is used, then the cost of the pre-retirement death benefit funded through the insurance policy is equal to the insurance premium. The statement in this question states that the plan actuary *may* use the premium to determine the cost of the death benefit provided through insurance contracts. That is true, as long as the actuary is using the split funded method. If the statement had said that the actuary *must* use the premium to determine the cost of the death benefit provided through insurance contracts, then the statement would have been false.

The statement is true.

Answer is A.

Question 39

Under the projected unit credit cost method, the accrued liability is equal to the present value of the beginning of year accrued benefit (using projected salary). When there are various assumed retirement ages, each present value must include the value if the participant retired at each assumed age, multiplied by the probability of retiring at that age. In this question, the assumed retirement ages are 62 and 65. The assumed probability of retiring at each age is:

Age 62: 15%
Age 65: 100% × 85% (probability of NOT retiring at age 62) = 85%

Smith is age 62 with 8 years of service as of 1/1/2021.

Accrued liability assuming retirement age 62:

Final 3-year average salary = $\frac{\$50,000 + \$51,500 + \$53,000}{3} = \$51,500$

1/1/2021 accrued benefit reduced to age 62 = 1.5% × \$51,500 × 8 years of service × 0.91 = \$5,623.80

Accrued liability = $\$5,623.80 \times \frac{N_{62}^{(12)}}{D_{62}} = \$5,623.80 \times \frac{307,180}{25,634} = \$67,392$

The commutation functions used are found in the tables of supplementary factors provided with the examination, for a male participant using 6% interest. Note that the normal form of benefit is assumed to be a life annuity, per the exam general conditions.

Accrued liability assuming retirement age 65:

Final 3-year average salary = $\$53,000 \times \frac{1.025 + 1.025^2 + 1.025^3}{3} = \$55,694$

1/1/2021 accrued benefit = 1.5% × \$55,694 × 8 years of service = \$6,683.28

Accrued liability = $\$6,683.28 \times \frac{N_{65}^{(12)}}{D_{62}} = \$6,683.28 \times \frac{237,129}{25,634} = \$61,824$

1/1/2021 accrued liability = (\$67,392 × 15%) + (\$61,824 × 85%) = \$62,659

Answer is B.

Question 40

The normal cost under the entry age normal funding method is based upon the projected benefit at assumed retirement age (65 in this question, per the general conditions of the exam), and are assumed to begin at hire age. The 2.5% salary scale is incorporated into the determination of the projected benefit. Smith was hired at age 45 and is age 55 as of the 1/1/2021 valuation date, so the 2020 salary must be projected 10 years to obtain the projected final salary. Smith will have 20 years of service at age 65.

Final salary = $\$70{,}000 \times 1.025^{10} = \$89{,}606$
Projected benefit = 2% × $\$89{,}606 \times 20$ years of service = $\$35{,}842$

The present value of benefits must be determined at entry age (age at hire, not the age of entry into the plan). Note that the discount for years prior to normal retirement age is based on interest only because there is no mention of any preretirement decrements (the general conditions for the exam state that there are no preretirement decrements).

The commutation functions used for the post-retirement annuity are found in the tables of supplementary factors provided with the examination, for a female participant using 6% interest.

$$PVFB_{45} = \$35{,}842 \times \ddot{a}_{65}^{(12)} \times v^{20} = \$35{,}842 \times \frac{N_{65}^{(12)}}{D_{65}} \times 0.311805$$

$$= \$35{,}842 \times \frac{256{,}348}{21{,}612} \times 0.311805 = \$132{,}559$$

The normal cost is equal to the PVFB amortized over the total years to retirement. Since there is a salary scale, and the normal cost must be determined as a level percentage of salary (per the general conditions of the exam), an implicit interest rate is used incorporating both the 6% interest rate and the 2.5% salary scale.

Implicit interest rate for amortizing = (1.06/1.025) – 1 = 0.034146, or 3.4146%

$NC_{45} = PVFB_{45} / \ddot{a}_{\overline{20}|.034146} = \$132{,}559/14.81188 = \$8{,}949.50$

The normal cost as of 1/1/2021 (when Smith is age 55) is equal to the normal cost at age 45, increased by 2.5% per year (since the normal cost increases by the same percentage as does the salary under the exam general conditions).

$NC_{55} = NC_{45} \times 1.025^{10} = \$8{,}949.50 \times 1.280085 = \$11{,}456$

Answer is C.

Question 41

The minimum required contribution for a multiemployer plan using the Entry Age Normal cost method is equal to the normal cost plus the amortization charges less the amortization credits. This is brought forward using the valuation interest rate to the end of the year.

The entry age normal method is an immediate gain method, so the experience gain or loss for 2020 is determined as a new base to be amortized over 15 years beginning on 1/1/2021. Note that this base is established on 1/1/2021, so it is not included in the given amortization charges for all bases established before 1/1/2021.

The experience gain or loss is equal to the difference between the actual unfunded liability and the expected unfunded liability.

The actual unfunded liability is equal to the excess of the accrued liability over the actuarial value of the assets. Note that the actuarial value of assets is not reduced by the credit balance for this purpose.

Actual $UAL_{1/1/2021} = \$425{,}000 - \$350{,}000 = \$75{,}000$

The expected unfunded liability is equal to the prior year unfunded accrued liability plus the prior year normal cost, increased with interest at the valuation interest rate to the current year, and then reduced by the prior year contribution (no interest is given to the 2020 contribution since it was contributed on the last day of the year).

Expected $UAL_{1/1/2021} = [(\$400{,}000 - \$300{,}000) + \$40{,}000] \times 1.07 - \$25{,}000 = \$124{,}800$

There is a gain because the actual UAL is less than the expected UAL.

2020 Gain = $\$124{,}800 - \$75{,}000 = \$49{,}800$

Amortization of 2020 gain (credit base) = $\$49{,}800 / \ddot{a}_{\overline{15}|} = \$5{,}110$

Minimum required $\text{contribution}_{12/31/2021} = (\$42{,}000 + \$40{,}000 - \$5{,}110) \times 1.07 = \$82{,}272$

The credit balance as of 12/31/2021 is equal to the excess of the sum of the 12/31/2020 credit balance (increased with interest for one year) and the 2021 contribution (which does not receive interest as it was contributed on 12/31/2021) over the minimum required contribution.

$CB_{12/31/2021} = [(\$100{,}000 \times 1.07) + \$35{,}000] - \$82{,}272 = \$59{,}728$

Answer is D.

Question 42

The gain or loss with regard to the retirement of a participant is equal to the difference between the actual liability (the value of the benefit that will actually be paid) and the expected liability (the accrued liability under the cost method had the participant not retired). Under the Unit Credit cost method, the accrued liability is equal to the present value of the benefit accrued as of the beginning of the year.

Smith has retired at age 61 with 16 years of service.

12/31/2020 accrued benefit = \$120 × 16 years of service = \$1,920

The reduced accrued benefit payable at age 61 is:

\$1,920 × [1 – (3% × 4 years)] = \$1,689.60

Smith has elected to receive the benefit in the form of a 5-year certain and life annuity.

5-year certain and life annuity payable at age 61 = \$1,689.60 × 0.97 = \$1,638.91

Actual liability = \$1,638.91 × 12 × 11.26 = \$221,450

For purposes of the unit credit accrued liability, the assumed retirement age is 65 (exam general conditions, also implied by the definition of the early retirement benefit).

$$\text{Expected liability} = \$1{,}920 \times 12 \times \frac{N^{(12)}_{65@7\%}}{D_{61@7\%}} = \$23{,}040 \times \frac{118{,}961}{15{,}413} = \$177{,}828$$

The commutation functions used are found in the tables of supplementary factors provided with the examination, for a male participant using 7% interest.

\$X = \$221,450 – \$177,828 = \$43,622

Answer is B.

Question 43

The quarterly contribution requirement applies under IRC section 430(j)(3)(A) when the funding target attainment percentage (FTAP) in the prior year is less than 100% (meaning the plan had a funding shortfall in the prior year). There was a funding shortfall in 2020, so the quarterly contribution requirement applies in 2021.

The four quarterly due dates for the 2021 plan year are 4/15/2021, 7/15/2021, 10/15/2021, and 1/15/2022.

The amount of the quarterly contribution under IRC section 430(j)(3)(D) is equal to 25% of the smaller of 90% of the minimum required contribution for the current year or 100% of the minimum required contribution for the preceding year.

90% of 2021 minimum required contribution = 90% × \$60,000 = \$54,000

The quarterly contribution due for each quarter of 2021 is equal to 25% of \$50,000 (because the 2020 minimum required contribution of \$50,000 is less than 90% of the 2021 minimum):

25% × \$50,000 = \$12,500

The contributions of \$15,000 made on each of the first three quarterly due dates are enough to pay for the \$12,500 required quarterly contributions. The final \$25,000 contribution for 2021 is made on 1/31/2022 and is 16 days late, if it was to be used to pay for the 1/15/2022 required quarterly contribution. However, the excess contribution from each of the first 3 quarters can be increased with interest from the date that they were made (using the plan effective rate) and used to pay for the 1/15/2022 required quarterly contribution. There was an excess contribution of \$2,500 on each of the first three quarterly due dates.

Accumulated excess contributions on 1/15/2022:

$$(\$2{,}500 \times 1.04^{9/12}) + (\$2{,}500 \times 1.04^{6/12}) + (\$2{,}500 \times 1.04^{3/12}) = \$7{,}649$$

This is insufficient to pay for the 1/15/2022 required quarterly contribution, so \$4,851 (\$12,500 – \$7,649) is late. As the final contribution for 2021 is not made until 1/31/2022, \$4,851 is late by 16 days. An additional 5 percentage points (for a total 9% rate) must be used to discount that part of the \$25,000 contribution for those 16 days (and then discounted using the 4% plan effective rate for the remaining period).

The statement is false.

Answer is B.

Question 44

The target normal cost is equal to the present value of the increase in the 2021 accrued benefit. Smith is age 40 on 1/1/2021, with 3 years of service.

Compensation must be limited to the IRC section 401(a)(17) limit (listed in a table provided with the exam) for each year before averaging. The 2018 compensation of $300,000 must be limited to $275,000; the 2019 compensation of $320,000 must be limited to $280,000; the 2020 compensation of $267,000 is not limited as it is below the IRC section 401(a)(17) compensation limit of $285,000.

$$\text{1/1/2021 accrued benefit} = 3\% \times \frac{275{,}000 + 280{,}000 + 267{,}000}{3} \times 3 \text{ years of service} = \$24{,}660$$

The assumed compensation increase of 4% is taken into account in determining the end of year accrued benefit. The projected 2021 compensation for Smith is:

$267,000 × 1.04 = $277,680, which is below the IRC section 401(a)(17) compensation limit (not provided for 2021, but below the 2020 limit of $285,000).

$$\text{12/31/2021 accrued benefit} = 3\% \times \frac{280{,}000 + 267{,}000 + 277{,}680}{3} \times 4 \text{ years of service} = \$32{,}987$$

The limitation of IRC section 415(b) must be considered with regard to the accrued benefit. Smith entered the plan on 1/1/2020 and has 1 year of plan participation as of 1/1/2021. The IRC section 415(b) dollar limit for 2021 is given as $230,000. This is reduced when years of plan participation are less than 10, as is the case for Smith.

$$\text{1/1/2021 IRC section 415(b) dollar limit} = \tfrac{1}{10} \times \$230{,}000 = \$23{,}000$$

The IRC section 415(b) percent of salary limit is equal to 100% of the high consecutive 3-year average salary, reduced when years of service are less than 10. Smith has 3 years of service as of 1/1/2021.

$$\text{1/1/2021 IRC section 415(b) percent of salary limit} = \tfrac{3}{10} \times \frac{275{,}000 + 280{,}000 + 267{,}000}{3} = \$82{,}200$$

The overall 415(b) limit is equal to the smaller of the dollar limit and the percent of salary limit. This is $23,000. The accrued benefit as of 1/1/2021 under the plan benefit formula must be limited to $23,000 for purposes of the determination of the target normal cost.

As of 12/31/2021, Smith has earned an additional year of plan participation, so the IRC section 415(b) dollar limit will double to $46,000. The IRC section 415(b) percent of salary limit will also increase, making the overall 415(b) limit equal to $46,000. The end of year accrued benefit is not limited for purposes of the determination of the target normal cost.

Increase in the 2021 accrued benefit for Smith = $32,987 – $23,000 = $9,987

For purposes of determining the present value, the commutation functions used are found in the tables of supplementary factors provided with the examination, for a female participant using 7% interest (since Smith is more than 20 years from the assumed retirement age of 65, the segment 3 interest rate is used). Note that there are no assumed pre-retirement decrements, age 65 is the assumed retirement age, and the assumed form of benefit is a life annuity (all due to the exam general conditions).

$$\text{Target normal cost} = \$9{,}987 \times \ddot{a}_{65}^{(12)} \times v_{7\%}^{25} = \$9{,}987 \times \frac{N_{65}^{(12)}}{D_{65}} \times 0.184249$$

$$= \$9{,}987 \times \frac{128{,}063}{11{,}739} \times 0.\ 184249 = \$20{,}074$$

Answer is D.

Question 45

For statutory hybrid (cash balance) plans as defined in IRC section 411(a)(13)(C), Treasury regulation 1.430(d)-1(f)(5) requires that the lump sum value used to determine the funding target is calculated by accumulating the cash balance plan contributions and accumulating them to retirement using the plan's interest crediting rate.

Statement I is false, as neither the applicable mortality table nor the valuation mortality table is used to determine the lump sum.

Statement II is false, as neither the applicable interest rates nor the valuation interest rates is used to determine the lump sum.

Answer is A.

Question 46

The four quarterly due dates for the 2021 plan year are 4/15/2021, 7/15/2021, 10/15/2021, and 1/15/2022.

On 6/30/2021 the plan sponsor elects to use $30,000 of the prefunding balance to pay for the minimum, and also makes a contribution to the plan. That means that the $45,000 required quarterly contribution that was due on 4/15/2021 is late by 2½ months. When a quarterly contribution is late, it must be discounted to 1/1/2021 using an interest rate of the plan effective rate plus an additional 5 percentage points (for a total 10% rate in this question) for the 2½ months that the contribution was made late (and then discounted using the 5% plan effective rate for the remaining period). So, for purposes of determining the value of the $45,000 that can be used to pay for part of the minimum required contribution, that amount is:

$\$45{,}000/[(1.10^{2.5/12})(1.05^{3.5/12})] = \$43{,}492$

Remaining minimum required contribution on 1/1/2021 = $200,000 – $43,492 – $30,000 = $126,508

This is accumulated at the plan effective rate to 6/30/2021 to find the additional contribution required to satisfy the minimum funding standard (in addition to the $45,000 that was used to satisfy the 4/15/2021 quarterly contribution requirement).

$\$X = \$45{,}000 + (\$126{,}508 \times 1.05^{6/12}) = \$174{,}632$

Answer is D.

Question 47

IRC section 430(h)(3)(D)(ii) provides that when a separate disabled life mortality table is used, it may only be used for participants who satisfy the definition of Social Security disability. As a result, the regular healthy mortality assumption must be used for any participants who do not satisfy the Social Security disability definition in this question.

The statement is true.

Answer is A.

Question 48

The asset valuation method described in this question is the smoothed value method that is detailed in Revenue Procedure 2000-40. The actuarial value of assets under this method is equal to the current market value of assets, adjusted by adding a percentage of past year losses and subtracting a percentage of past year gains, with a smoothing period of no more than 5 years. This question uses a 4-year smoothing period.

The adjustment to the 1/1/2021 market value of assets is equal to ¾ of the gain/loss during 2020, plus/minus ½ (two-fourths) of the gain/loss during 2019, plus/minus ¼ of the gain/loss during 2018. Losses are added, and gains are subtracted.

The gains and losses for each prior year have been provided in this question.

Under Revenue Procedure 2000-40, in no event can the actuarial value of assets exceed 120% of the market value of assets, or be less than 80% of the market value of assets.

$AVA_{1/1/2021}$ = \$80,000 + (¾ × \$25,000) – (½ × \$500) + (¼ × \$4,000)
= \$99,500, but not more than \$96,000 (\$80,000 × 120%)

\$X = Actuarial value of assets as of 1/1/2021 is \$96,000.

Answer is C.

Question 49

I. A waived deficiency is amortized in 5 installments beginning with the following plan year (Treasury regulation 1.430(a)-1(d)(1)). The amortization installments of a waived deficiency is determined by applying the segment 1 interest rate for the first 4 installments, and the segment 2 interest rate for the 5th installment, as the 5th installment would occur at the beginning of the 6th year following the occurrence of the waived deficiency. Also see Treasury regulation 1.430(h)(2)-1(f)(2). The statement is false.

II. Treasury regulation 1.430(a)-1(e)(2) provides that when the funding shortfall for a plan year is zero, then the waiver amortization bases for all preceding years are reduced to zero, and considered to be fully amortized. The statement is true.

III. Treasury regulation 1.430(a)-1(d)(1) provides that waiver amortization installments are determined using the interest rates that apply to the year for which the waiver is obtained, and are not re-determined in any subsequent year. The statement is false.

Answer is C.

Question 50

IRC section 430(f)(8) requires that the unused funding balance be adjusted for interest using the actual asset rate of return for a plan year in order to determining the remaining funding balance as of the first day of the subsequent plan year. In this question there are no subtractions or additions to the prefunding balance for 2020, so the entire $100,000 prefunding balance would be adjusted using the actual rate of return on the 2020 market value of assets in order to determine the prefunding balance as of 1/1/2021.

Answer is A.

Question 51

In a cash balance plan, the funding target is equal to the present value of the projected account balance (based on prior year pay credits to the plan). In this question, the projected account balance for Smith is provided. In order to determine the present value for funding purposes, the projected account balance is discounted using the funding interest rate. Smith is age 60 on 1/1/2021, so the lump sum would be paid in 5 years, although technically on the first day of the sixth year from 1/1/2021. The segment 2 rate of 6% is used for funding (segment 2 rates are used for payments made 6 to 20 years from the valuation date).

1/1/2021 funding target (current form of payment assumption) = \$120,000 ÷ 1.06^5 = \$89,671

Under the proposed form of payment assumption, there is a 40% probability of Smith electing to receive a life annuity. The projected account balance must be converted to a life annuity using the given conversion factor.

Life annuity = \$120,000 ÷ 12.5 = \$9,600.

The funding target using the proposed form of payment assumption is equal to the sum of the product of the funding target based on each possible form of payment and the probability of retiring at that age. For the possible life annuity, the segment 2 interest rate of 6% would be used to discount the benefits payable between ages 65 and 80, with the segment 3 interest rate used for all additional payments. The commutation functions used are found in the tables of supplementary factors provided with the examination, for a <u>male</u> participant using 6% and 7% interest. Note that no pre-retirement decrements are assumed (exam general conditions), so there is an interest-only discount prior to the assumed retirement age.

$$\text{Proposed 2021 funding target} = \left(40\% \times \$9{,}600 \times \left[\frac{N^{(12)}_{65@6\%} - N^{(12)}_{80@6\%}}{D_{65@6\%}} v^5_{6\%} + \frac{N^{(12)}_{80@7\%}}{D_{65@7\%}} v^5_{7\%}\right]\right) + (60\% \times \$89{,}671)$$

$$= \left(\$3{,}840 \times \left[\frac{237{,}129 - 44{,}316}{21{,}046}(0.747258) + \frac{19{,}930}{11{,}432}(0.712986)\right]\right) + \$53{,}803$$

= \$31,062 + \$53,803 = \$84,865

\$X = \$89,671 – \$84,865 = \$4,806

Answer is A.

Question 52

The initial excise tax for failure to satisfy minimum funding is described in IRC section 4971(a)(1). There is no authority under that IRC section for the IRS to waive the initial excise tax. (Note that IRC section 4971(f) does give the IRS authority in certain circumstances the authority to waive the initial excise tax upon failure to pay a liquidity shortfall, but there is no such authority for waiving the initial excise tax upon failure to pay the minimum required contribution.)

The statement is false.

Answer is B.

Question 53

Revenue Procedure 2000-40, section 5.01, provides rules with regard to creating a new amortization base when there is a change in a cost method for a multiemployer plan. Changing the method of determining actuarial value of assets is deemed to be a change in cost method under the Revenue Procedure.

A new amortization base is established equal to the increase (decrease) in unfunded accrued liability (accrued liability less actuarial value of assets) due to the change in cost method. This new amortization base is to be amortized over a period of 10 years as required in Revenue Procedure 2000-40, section 5.01.

Unfunded accrued liability using smoothed value method = \$3,700,000 – \$3,000,000 = \$700,000

Unfunded accrued liability using market value = \$3,700,000 – \$3,500,000 = \$200,000

Decrease in unfunded accrued liability = \$700,000 – \$200,000 = \$500,000

Under the projected unit credit method, the change in actuarial value of assets does not impact the normal cost or the amortization of any previously maintained bases. So the change in the **smallest amount that satisfies the minimum funding standard** is equal to the amortization of the new base, increased with interest to the end of the year.

$X = (\$500,000/ \ddot{a}_{\overline{10}|6\%}) \times 1.06 = \$64,089 \times 1.06 = \$67,934$

Answer is E.

Question 54

Treasury regulation 1.430(d)-1(f)(4)(iii) provides that when a lump sum benefit option is assumed, the target normal cost and funding target used to determine the minimum required contribution generally are calculated using the funding segment rates, not the IRC section 417 segment rates. The one exception occurs when the interest assumption for lump sum actuarial equivalence under the plan provisions is something other than the IRC section 417 segment rates.

In this question, the plan equivalence for a lump sum uses the IRC section 417 segment rates, so the plan funding segment rates are used to determine the minimum required contribution.

The statement is false.

Answer is B.

Question 55

I. Treasury regulation 1.430(d)-1(c)(1)(iii)(C) states that "The determination of the funding target and target normal cost for a plan year must take into account any limitation on prohibited payments under section 436(d) with respect to any annuity starting date that was before the valuation date." (It also goes on to say that any limitation on prohibited payments under section 436(d) with respect to any annuity starting date that is on or after the valuation date is not taken into account.) The statement is true.

II. Treasury regulation 1.430(d)-1(c)(1)(iii)(A) states that "The determination of the funding target and target normal cost for a plan year must take into account any limitation on unpredictable contingent event benefits under section 436(b) with respect to any unpredictable contingent event which occurred before the valuation date, and must not take into account anticipated limitations on unpredictable contingent event benefits under section 436(b) with respect to any unpredictable contingent events which are expected to occur on or after the valuation date.") The statement is false.

III. Treasury regulation 1.430(d)-1(c)(1)(iii)(D) states that "The determination of the funding target and target normal cost for a plan year must take into account any limitation on benefit accruals under section 436(e) applicable before the valuation date." However, any limitation with respect to benefit accruals expected to take effect on or after the valuation date are ignored. The statement is true.

Answer is E.

Question 56

The balance equation for multiemployer plans for any plan that maintains amortization bases is:

Unfunded liability = Outstanding balance – Credit balance

For an immediate gain cost method (such as Entry Age Normal), the unfunded liability is equal to the excess of the accrued liability over the actuarial value of assets.

Using the valuation results as of 1/1/2021:

Unfunded liability = $300,000 – $240,000 = $60,000

Substituting into the balance equation:

$60,000 = ($210,000 – $90,000) – Credit Balance → Credit Balance = $60,000

The credit balance as of 12/31/2020 is the same as the credit balance as of 1/1/2021, so $X = $60,000.

Answer is C.

Question 57

The normal cost under the Entry Age Normal funding method is based upon the projected benefit at assumed retirement age (65 in this question, per the general conditions of the exam), and the normal costs are assumed to begin at hire age. The 2% salary scale is incorporated into the determination of the projected benefit. Smith was hired at age 50 and is age 60 as of the 1/1/2021 valuation date, so the 2020 salary must be projected 5 years to obtain the projected final salary. Smith will have 15 years of service at age 65.

Final salary = $\$40{,}000 \times 1.02^5 = \$44{,}163$
Projected benefit = $60\% \times \$44{,}163 = \$26{,}498$

The present value of benefits must be determined at entry age (age at hire, not the age of entry into the plan). Note that the discount for years prior to normal retirement age is based on interest only because there is no mention of any preretirement decrements (the general conditions for the exam state that there are no preretirement decrements).

The commutation functions used for the post-retirement annuity are found in the tables of supplementary factors provided with the examination, for a male participant using 6% interest.

$$PVFB_{50} = \$26{,}498 \times \ddot{a}_{65}^{(12)} \times v^{15} = \$26{,}498 \times \frac{N_{65}^{(12)}}{D_{65}} \times 0.417265$$

$$= \$26{,}498 \times \frac{237{,}129}{21{,}046} \times 0.417265 = \$124{,}578$$

The normal cost is equal to the PVFB amortized over the total years to retirement. Since there is a salary scale, and the normal cost must be determined as a level percentage of salary (per the general conditions of the exam), an implicit interest rate is used incorporating both the 6% interest rate and the 2% salary scale.

Implicit interest rate for amortizing = (1.06/1.02) – 1 = 0.039216, or 3.9216%

$NC_{50} = PVFB_{50} / \ddot{a}_{\overline{15}|.039216} = \$124{,}578/11.61803 = \$10{,}723$

The normal cost as of 1/1/2021 (when Smith is age 60) is equal to the normal cost at age 50, increased by 2% per year (since the normal cost increases by the same percentage as does the salary under the exam general conditions).

$NC_{60} = NC_{50} \times 1.02^{10} = \$10{,}723 \times 1.218994 = \$13{,}071$

Answer is B.