Solutions to EA-2(F) Examination
Fall, 2018

Question 1

Contributions for a plan year are interest-adjusted from the date made to the valuation date using the plan effective rate for that plan year, not the prior plan year (IRC section 430(j)(2)). The statement is false.

Answer is B.

Question 2

The frozen initial liability (FIL) cost method consists of a normal cost and various amortization charges and credits. This question concerns the normal cost and not the amortization bases.

The normal cost under the frozen initial liability cost method is equal to:

$$\frac{\text{Present value of future benefits - Actuarial value of assets - Unfunded liability}}{\text{Temporary annuity}}$$

Note that the actuarial value of assets is not reduced by the credit balance for purposes of the normal cost calculation under the FIL cost method (although there is no credit balance in this question – the 12/31/2018 credit balance is zero, and it must be assumed that the credit balance as of 1/1/2018 is also zero as there is not enough information to be able to deduce it).

When the plan benefits are based upon compensation (not known as the benefit formula is not given, but implied by the salary scale assumption), the temporary annuity is equal to the ratio of the present value of future compensation to current compensation (general conditions of the exam).

$$\text{Normal cost}_{1/1/2018} = \frac{160{,}000 - 75{,}000 - 50{,}000}{600{,}000 / 75{,}000} = 4{,}375$$

In order to determine the actual normal cost for 2019, experience must be used to adjust the 1/1/2018 valuation results to 1/1/2019. Since there were no new participants and no retirees (all participants were under retirement age as of 1/1/2018), the present value of future benefits will increase at the valuation rate of 7% (all participants will be one year closer to retirement age).

$PVFB_{1/1/2019} = 160{,}000 \times 1.07 = 171{,}200$

The unfunded liability is adjusted by adding the 2018 normal cost (which is a new 2018 liability), increasing the total with interest at 7%, and reducing the result by the interest-adjusted 2018 contribution (receiving only 6 months of interest because it was contributed halfway through 2018).

$UL_{1/1/2019} = [(50{,}000 + 4{,}375) \times 1.07] - (7{,}250 \times 1.07^{6/12}) = 50{,}682$

The present value of future compensation must be adjusted by a reduction in the 2018 salary (assumed paid on 1/1/2018), and interest of 7%.

$PVFS_{1/1/2019} = (600{,}000 - 75{,}000) \times 1.07 = 561{,}750$

2019 salary = $75{,}000 \times 1.03 = 77{,}250$

The 1/1/2019 actual normal cost can now be determined.

$$\text{Normal cost}_{1/1/2019} = \frac{171{,}200 - 80{,}000 - 50{,}682}{561{,}750 / 77{,}250} = 5{,}572$$

Answer is D.

Question 3

The quarterly contribution requirement applies under IRC section 430(j)(3)(A) when the 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).

1/1/2018 funding shortfall = \$2,850,000 – (\$2,325,000 – \$32,000) = \$557,000

Quarterly contributions are required for 2019. The four quarterly due dates for the 2019 plan year are 4/15/2019, 7/15/2019, 10/15/2019, and 1/15/2020.

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.

90% of 2019 minimum required contribution = 90% × \$475,000 = \$427,500

The quarterly contribution due for each quarter of 2019 is equal to 25% of \$427,500 (because 90% of the 2019 minimum required contribution is less than the 2018 minimum):

25% × \$427,500 = \$106,875

The prefunding balance has been elected to be used to pay for the minimum required contribution, so it is also used to pay for the quarterly required contributions, as needed. There was no addition made to the prefunding balance as of 1/1/2019 because the 2018 contribution was exactly equal to the minimum required contribution. So the entire $35,000 prefunding balance as of 1/1/2019 is available to pay for the 2019 quarterly contributions. (Note that if there had been an addition to the prefunding balance from a receivable contribution for 2018 made after a 2019 quarterly due date, then that addition could not be used to pay for that quarterly contribution on a timely basis.)

When a funding balance is used to pay for required quarterly contributions, the funding balance is increased using the plan effective interest rate from the first day of the plan year to the quarterly due date.

Prefunding balance on 4/15/2019 = $35,000 × $1.065^{3.5/12}$ = $35,649

This is not enough to pay for the entire 4/15/2019 quarterly contribution requirement, so the balance is considered to be late, as no contributions are made for 2019 until 6/1/2019.

4/15/2019 late quarterly contribution = $106,875 – $35,649 = $71,226

The $71,226 contribution for 2019 is made on 6/1/2019, and must be discounted to 1/1/2019 (the valuation date), generally using the effective interest rate of 6.5%. However, this is needed to pay for the 4/15/2019 quarterly contribution requirement. The contribution is late by 1½ months, and an additional 5 percentage points (for a total 11.5% rate) must be used to discount the contribution for those 1½ months (and then discounted using 6.5% for the remaining period).

The present value of the $71,226 contribution as of 1/1/2019 is:

$\$71{,}226 \times v_{11.5\%}^{1.5/12} \times v_{6.5\%}^{3.5/12} = \$71{,}226 \times 0.986485 \times 0.981800 = \$68{,}985$

The balance of the 6/1/2019 contribution will pay for the remaining quarterly contribution requirements, so there is no additional interest penalty to consider. The balance of the 6/1/2019 contribution is equal to the 2019 minimum required contribution, reduced by the $35,000 prefunding balance and the $68,985 present value of the contribution needed to satisfy the 4/15/2019 quarterly contribution requirement, all increased with interest at the effective rate of 6.5% to the contribution date of 6/1/2019.

Balance of 6/1/2019 contribution = ($475,000 – $68,985 – $35,000) × $1.065^{5/12}$ = $380,879

Total 6/1/2019 contribution = $380,879 + $71,226 = $452,105

Answer is D.

Question 4

IRC section 432(c)(3)(A) states that for a plan in endangered status, the funding improvement plan must satisfy two requirements:

(1) The funded percentage as of the close of the funding improvement period must be at least as large as the funded percentage as of the beginning of the plan year in which the plan was first certified as endangered plus 33% of the difference between 100% and that initial funded percentage, and

(2) The plan does not have a funding deficiency during the last year of the funding improvement period.

The question states that the plan is projected to not have a funding deficiency in any of the next 15 years. IRC section 432(c)(4)(A) provides that the funding improvement period is 10 years, so the plan is not projected to have a funding deficiency in the final year of the funding improvement period.

The funded percentage as defined in IRC section 432(j)(2) is equal to the ratio of the actuarial value of assets to the unit credit accrued liability. As of 1/1/2019, this is:

Funded percentage = 2,000,000/2,900,000 = 68.97%

X% = 68.97% + [(100% - 68.97%) × 33%] = 68.97% + 10.24% = 79.21%

Answer is D.

Question 5

Each participant in this question is 30 years old with 6 years of service as of the 1/1/2019 valuation date. The service requirement in order to receive the supplemental benefit is 35 years, and the participants will each be age 59 when they reach 35 years of service. So, the earliest retirement age (and in this case, the only assumed retirement age) at which the supplemental benefit would be paid is age 60.

Treasury regulation 1.430(d)-1(c)(1)(ii) provides rules for allocating a benefit that is not earned as a function of years of service with regard to the target normal cost. In this case, each participant will have 36 years of service at age 60. Therefore, $1/36^{th}$ of the \$600 per month supplemental benefit is used as a current year "accrual" for the target normal cost.

Supplemental benefit for target normal cost = \$600 × 1/36 = \$16.67/mo, or \$200/yr.

The target normal cost is equal to the present value of the \$16.67 "accrual" with regard to the supplemental benefit. The supplemental benefit is assumed to be paid beginning at age 60, and ending at age 62, so with the plan participants currently age 30, only the segment 3 interest rate of 7% is used (all benefit payments will be made more than 20 years from the 1/1/2019 valuation date). The commutation functions used are found in the tables of supplementary factors provided with the examination, for a male participant using 7% interest.

Note that the probability of retiring at age 60 is equal to 28% (the 40% probability of not retiring at age 55 multiplied by the 70% probability of retiring at age 60).

Supplemental benefit target normal cost

$$= 100 \text{ participants} \times 28\% \times \$200 \times \ddot{a}^{(12)}_{60:\overline{2}|7\%} \times v^{30}_{7\%}$$

$$= \$5{,}600 \times \left[\frac{N^{(12)}_{60@7\%} - N^{(12)}_{62@7\%}}{D_{60@7\%}} \right] \times 0.131367 = \$5{,}600 \times \left[\frac{185{,}398 - 154{,}569}{16{,}499} \right]$$

$$= \$1{,}375$$

Answer is A.

Question 6

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

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

Using that formula and the valuation results before the plan amendment,

$$\$75{,}000 = \frac{(\$1{,}350{,}000 + \$300{,}000) - \$750{,}000}{\text{Temporary annuity}} \quad \rightarrow \quad \text{Temporary annuity} = 12$$

Under the terms of the plan amendment, only the present value of future benefits for the active participants is affected. 75% are assumed to elect the subsidized joint and survivor annuity, and 25% are assumed to elect the existing life annuity.

The present value of future benefits for the active participants under the amended plan is:

$(75\% \times \$1{,}350{,}000 \times 14/12) + (25\% \times \$1{,}350{,}000) = \$1{,}518{,}750$

$$\$X = \frac{(\$1{,}518{,}750 + \$300{,}000) - \$750{,}000}{12} = \$89{,}063$$

Answer is C.

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

There were no amortization bases prior to 2018 because the funding target attainment percentage as of 1/1/2017 was 100%, which would have fully amortized any bases existing as of that date (see the definition of funding target attainment percentage in IRC section 430(d)(2) as well as IRC section 430(c)(6)).

The amortization of the 1/1/2018 funding shortfall is:

$$\$100{,}000/5.9982 = \$16{,}672$$

The outstanding balance of the 2018 shortfall amortization base as of 1/1/2019 can be determined using the 6-year amortization factor for 2019 (there are 6 years left to pay off the 2018 shortfall base). The factor is equal to the present value of the remaining six amortization payments as of 1/1/2019, using the 2019 segment rates. The first 5 payments are discounted using the segment 1 rate of 5.5%, as they will be paid within the next 5 years, and the final payment is discounted using the segment 2 rate of 6.5%, as it will be paid at the beginning of the sixth year.

Outstanding balance of 2018 shortfall amortization base as of 1/1/2019 =

$$\$16{,}672 \times \left[\ddot{a}_{\overline{5}|5.5\%} + v^{5}_{6.5\%}\right] = \$16{,}672 \times [4.50515 + 0.72988] = \$87{,}278$$

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

$\text{Funding shortfall}_{1/1/2019} = \$10{,}000{,}000 - (\$9{,}000{,}000 - \$75{,}000) = \$1{,}075{,}000$

The 2019 shortfall base is equal to the funding shortfall less the outstanding balance of the prior shortfall base, and the base is amortized over 7 years.

2019 shortfall amortization base = \$1,075,000 – \$87,278 = \$987,722

$$\begin{aligned}\text{Amortization of 2019 shortfall base} &= \$987{,}722 \div \left[\ddot{a}_{\overline{5}|5.5\%} + \ddot{a}_{\overline{2}|6.5\%} v^{5}_{6.5\%}\right] \\ &= \$987{,}722 \div [4.50515 + (1.93897)(0.72988)] \\ &= \$166{,}835\end{aligned}$$

2019 minimum required contribution = $2,000,000 + $16,672 + $166,835 = $2,183,507

The **smallest amount that satisfies the minimum funding standard** is:

$2,183,507 – $75,000 = $2,108,507

Answer is B.

Question 8

The liability for a plan amendment in a plan using the Aggregate cost method is amortized as part of the normal cost. The normal cost is amortized using a temporary annuity that reflects the average future working lifetime of the active plan participants. A 15-year amortization factor is not used for this purpose.

The statement is false.

Answer is B.

Question 9

Funding deficiency as of 12/31/2019 = $200,000 – $180,000 = $20,000.

IRC section 4971(a)(2) imposes a 5% excise tax when a multiemployer plan experiences a funding deficiency. Note that IRC section 4971(g) provides special rules when the plan is in critical, or critical and declining status, which is not the case in this question.

Excise tax = $20,000 × 5% = $1,000

The statement is true.

Answer is A.

Question 10

The funding target is equal to the present value of the benefit accrued as of the first day of the year. Smith is age 39 on 1/1/2019, with 7 years of service.

1/1/2019 accrued benefit = \$375 × 7 years of service = \$2,625

Smith is more than 20 years from retirement at all assumed retirement ages in this question, so the segment 3 interest rate of 7% 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 7% 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 funding target using the prior assumption of age 65 is:

$$\$2{,}625 \times 12 \times \frac{N_{65}^{(12)}}{D_{65}} \div 1.07^{26} = \$31{,}500 \times \frac{116{,}056}{11{,}403} \times 0.172195 = \$55{,}205$$

Under the new retirement age assumption for 2019, the rate of retirement at each age is:

62: 20%
63: 80% × 40% = 32%
65: 80% × 60% × 100% = 48%

The accrued benefit is not reduced for early retirement, and the funding target under the new 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. This is:

$$\begin{aligned}
&\left(20\% \times \$31{,}500 \times \frac{N_{62}^{(12)}}{D_{62}} \div 1.07^{23}\right) \\
&\qquad + \left(32\% \times \$31{,}500 \times \frac{N_{63}^{(12)}}{D_{63}} \div 1.07^{24}\right) + \left(48\% \times \$31{,}500 \times \frac{N_{65}^{(12)}}{D_{65}} \div 1.07^{26}\right) \\
&= \left(20\% \times \$31{,}500 \times \frac{154{,}569}{14{,}271} \times 0.210947\right) \\
&\qquad + \left(32\% \times \$31{,}500 \times \frac{140{,}764}{13{,}257} \times 0.197147\right) + \left(48\% \times \$31{,}500 \times \frac{116{,}056}{11{,}403} \times 0.172195\right) \\
&= \$61{,}993
\end{aligned}$$

\$X = \$61,993 – \$55,205 = \$6,788

Answer is A.

Question 11

The 2018 contributions must be discounted using the 2018 plan effective rate of 4% from the date of contribution to 1/1/2018 in order to find their value as of the valuation date.

Discounted value of 2018 contributions = ($55,000/1.04$^{1/12}$) + ($100,000/1.04$^{2.5/12}$)
= $54,821 + $99,186 = $154,007

There is an excess contribution because the discounted value of the 2018 contributions exceeds the minimum required contribution.

2018 excess contribution = $154,007 – $150,000 = $4,007

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

In addition, the employer has elected to use the $5,000 funding standard carryover balance to help pay for the minimum required contribution, which results in an additional excess contribution of $5,000.

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)). However, Treasury regulation 1.430(f)-1(b)(3)(iii) requires that to the extent that part of the excess contribution came from an election to use a funding balance to pay for the minimum required contribution, that part of the excess contribution is increased using the asset rate of return for the year instead of the plan effective rate. So, the $5,000 excess contribution due to the election to use the carryover balance is increased using the 2018 asset return rate of 12%, and the $4,007 actual excess contribution is increased using the plan effective rate of 4%. The 1/1/2018 prefunding balance is increased with interest using the 2018 actual asset rate of return (see IRC section 430(f)(8)).

1/1/2019 prefunding balance = ($25,000 × 1.12) + ($4,007 × 1.04) + ($5,000 × 1.12) = $37,767

Answer is D.

Question 12

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

Funding shortfall$_{1/1/2019}$ = \$36,600,000 – (\$41,000,000 – \$4,050,000) = -\$350,000

The funding shortfall is negative, so there is no shortfall amortization base created for 2019. (There were no shortfall amortization bases for any prior year either, as the question states that there has been no funding shortfall for every year prior to 2019.)

In addition, IRC section 430(a)(2) states that when the plan assets (reduced by the funding balances) exceeds the funding target, that excess reduces the target normal cost. In this question, the excess is \$350,000. The **minimum required contribution** in this question is the target normal cost, reduced by \$350,000.

Minimum required contribution = \$2,400,000 – \$350,000 = \$2,050,000

The contribution for 2019 is made on 7/1/2019, so there must be an interest adjustment for 6 months using the 2019 plan effective rate of 6%.

$X = \$2,050,000 \times 1.06^{6/12} = \$2,110,604$

Answer is B.

Question 13

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 3% salary scale is incorporated into the determination of the projected benefit. Smith was hired at age 25 and is age 45 as of the 1/1/2019 valuation date, so the 2018 salary must be projected 20 years to obtain the projected final salary. Smith will have 40 years of service at age 65.

Final salary = $\$40{,}500 \times 1.03^{20} = \$73{,}148$
Projected benefit = 2% × $\$73{,}148 \times 40$ years of service = $\$58{,}518$

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 7% interest.

$$PVFB_{25} = \$58{,}518 \times \ddot{a}_{65}^{(12)} \times v^{40} = \$58{,}518 \times \frac{N_{65}^{(12)}}{D_{65}} \times 0.066780$$

$$= \$58{,}518 \times \frac{121{,}532}{11{,}524} \times 0.066780 = \$41{,}212$$

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 7% interest rate and the 3% salary scale.

Implicit interest rate for amortizing = (1.07/1.03) – 1 = .038835, or 3.8835%

$$NC_{25} = PVFB_{25} / \ddot{a}_{\overline{40}|.038835} = \$41{,}212/20.922762 = \$1{,}970$$

The normal cost as of 1/1/2019 (when Smith is age 45) is equal to the normal cost at age 25, increased by 3% per year (since the normal cost increases by the same percentage as does the salary under the exam general conditions).

$NC_{45} = NC_{25} \times 1.03^{20} = \$1{,}970 \times 1.806111 = \$3{,}558$

Answer is C.

Question 14

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 1/1/2019 market value of assets is equal to ¾ of the gain/loss during 2018, plus/minus ½ (two-fourths) of the gain/loss during 2017, plus/minus ¼ of the gain/loss during 2016. Losses are added, and gains are subtracted.

The asset gain/loss has been provided for each year other than 2018. The asset gain/loss for 2018 is equal to the difference between the actual market value of assets as of 1/1/2019 (500,000) and the expected value of assets. The expected value is determined by calculating the expected 2018 earnings using the valuation interest rate of 7%. Note that as benefit payments, expenses and contributions all are paid on the first day of the year, everything receives a full year of expected earnings.

Expected $AVA_{1/1/2019}$
$= (435{,}000 \times 1.07) + (55{,}000 \times 1.07) - (35{,}000 \times 1.07) = 486{,}850$

The actual assets as of 1/1/2019 are 500,000, so there is a 2018 asset gain of 13,150 (500,000 – 486,850).

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.

$AVA_{1/1/2019} = 500{,}000 - (¾ \times 13{,}150) - (½ \times 22{,}400) + (¼ \times 19{,}850)$
$= 483{,}900$, but not less than $400{,}000$ $(500{,}000 \times 80\%)$

The actuarial value of assets as of 1/1/2019 is 483,900.

Answer is B.

Question 15

The funding target is equal to the present value of the benefit accrued as of the first day of the year. Smith is age 60 on 1/1/2019, with 14 years of service.

1/1/2019 accrued benefit = \$50 × 14 years of service = \$700

The accrued benefit must be reduced at the rate of 3% per year prior to age 65 (6% reduction at age 63).

Accrued benefit payable at age 63 = \$700 × 0.94 = \$658

For the assumed retirement age of 63, Smith is 3 years from age 63, so the segment 1 interest rate of 3% is used to discount retirement benefits paid from age 63 through age 65, the segment 2 interest rate of 4% is used to discount retirement benefits paid from age 65 through age 80, and the segment 3 interest rate of 5% is used to discount benefits paid at age 80 and later. 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 are found in the tables of supplementary factors provided with the examination, for a male participant using 3%, 4%, and 5% interest.

The funding target assuming a retirement age of 63 is:

$$\$X = \$658 \times 12 \times \left[\frac{N^{(12)}_{63@3\%} - N^{(12)}_{65@3\%}}{D_{63@3\%}} v^3_{3\%} + \frac{N^{(12)}_{65@4\%} - N^{(12)}_{80@4\%}}{D_{63@4\%}} v^3_{4\%} + \frac{N^{(12)}_{80@5\%}}{D_{63@5\%}} v^3_{5\%} \right]$$

$$= \$7{,}896 \times \left[\frac{2{,}214{,}765 - 1{,}932{,}494}{146{,}171}(0.915142) + \frac{940{,}882 - 198{,}530}{79{,}526}(0.888996) + \frac{88{,}005}{43{,}519}(0.863838) \right]$$

$$= \$93{,}272$$

For the assumed retirement age of 65, Smith is 5 years from age 65, so the segment 1 interest rate of 3% is not used, the segment 2 interest rate of 4% is used to discount retirement benefits paid from age 65 through age 80, and the segment 3 interest rate of 5% is used to discount benefits paid at age 80 and later.

The funding target assuming a retirement age of 65 is:

$$\$Y = \$700 \times 12 \times \left[\frac{N^{(12)}_{65@4\%} - N^{(12)}_{80@4\%}}{D_{65@4\%}} v^5_{4\%} + \frac{N^{(12)}_{80@5\%}}{D_{65@5\%}} v^5_{5\%} \right]$$

$$= \$8{,}400 \times \left[\frac{940{,}882 - 198{,}530}{72{,}412}(0.821927) + \frac{88{,}005}{38{,}875}(0.783526) \right] = \$85{,}680$$

\$X – \$Y = \$93,272 – \$85,680 = \$7,592

Answer is B.

Question 16

The four quarterly due dates for the 2019 plan year are 4/15/2019, 7/15/2019, 10/15/2019, and 1/15/2020. The first contribution for 2019 of $1,200,000 was paid on 6/1/2020, so all quarterly contributions of $250,000 are late.

Generally, contributions are discounted from the date contributed to the valuation date using the plan effective rate, to find their value for purposes of applying them to the minimum required contribution. However, the amounts used to pay for late quarterly contributions must be discounted with an additional 5 percentage points (for a total rate of 10% -- the 5% plan effective rate plus the additional five percentage points) from the date paid to the quarterly due date, and then from the quarterly due date to 1/1/2019 using the plan effective rate of 5%. The 4/15/2019 quarterly contribution was paid 13½ months late, the 7/15/2019 quarterly contribution was paid 10½ months late, the 10/15/2019 quarterly contribution was paid 7½ months late, and the 1/15/2020 quarterly contribution was paid 4½ months late. This accounts for $1,000,000 of the $1,200,000 contribution, and the remaining $200,000 is discounted only using the 5% plan effective rate. (Note that even though a quarterly contribution is late, it is satisfied once the amount of the quarterly contribution -- $250,000 in this question – is paid. The $250,000 does not grow with interest if late.)

The present value of the 6/1/2020 contribution as of 1/1/2019 is:

$$250{,}000\, v_{10\%}^{\frac{13.5}{12}} v_{5\%}^{\frac{3.5}{12}} + 250{,}000\, v_{10\%}^{\frac{10.5}{12}} v_{5\%}^{\frac{65}{12}} + 250{,}000\, v_{10\%}^{\frac{7.5}{12}} v_{5\%}^{\frac{95}{12}} + 250{,}000\, v_{10\%}^{\frac{4.5}{12}} v_{5\%}^{\frac{125}{12}} + 200{,}000\, v_{5\%}^{\frac{17}{12}}$$
$$= 221{,}408 + 223{,}998 + 226{,}618 + 229{,}269 + 186{,}643 = 1{,}087{,}936$$

The **smallest amount that satisfies the minimum funding standard** is equal to the minimum required contribution less any funding balances. There are no funding balances in this question, so the additional contribution $X made on 9/15/2020 must pay for the remaining minimum required contribution.

Remaining minimum required contribution = $1,740,000 – $1,087,936 = $652,064

$$\$X = \$652{,}064 \times v_{5\%}^{\frac{20.5}{12}} = \$708{,}742$$

Answer is D.

Question 17

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 these items have been provided for both the 2018 and 2019 plan years. In addition, the contribution for each plan year has been provided. There is a credit balance if the credits (prior credit balance, contributions, and amortization credits) exceed the charges (normal cost and amortization charges). The credit balance 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). The actual rate of return on the assets (3% each year) is irrelevant for this question.

Credit balance as of 12/31/2018 = ($300,000 + $85,000 – $250,000 – $120,000) × 1.06 = $15,900

The contribution for 2019 is contributed on 7/1/2019, so it only receives 6 months of interest (3%, half of the 6% valuation interest rate). This is simple interest, and it would also be acceptable to use compound interest ($1.06^{6/12} - 1 = 0.029563$, or 2.9563%).

Credit balance as of 12/31/2019 = ($15,900 + $68,000 – $235,000 – $80,000) × 1.06
+ ($325,000 × 1.03) = $89,784

Answer is D.

Question 18

The target normal cost is equal to the present value of the increase in the benefit accrual for the year. The accrued benefit must be determined on each of 1/1/2019 and 12/31/2019 for Smith. For 2019, the assumed salary increase of 3% is applied to the 2018 salary to determine an expected 2019 salary.

$$\text{Final 3-year average salary as of 1/1/2019} = \frac{\$80{,}000 + \$85{,}000 + \$90{,}000}{3} = \$85{,}000$$

$$\text{Final 3-year average salary as of 12/31/2019} = \frac{\$85{,}000 + \$90{,}000 + (\$90{,}000 \times 1.03)}{3} = \$89{,}233$$

Smith has 20 years of service as of 1/1/2019, and 21 years of service as of 12/31/2019.

Accrued benefit as of 1/1/2019 = 1.25% × \$85,000 × 20 years of service = \$21,250
Accrued benefit as of 12/31/2019 = 1.25% × \$89,233 × 21 years of service = \$23,424

Increase in 2019 accrued benefit = \$23,424 – \$21,250 = \$2,174

Smith is age 50 as of 1/1/2019, 15 years from the normal retirement age of 65 (per the general conditions of the exam), so the segment 1 interest rate of 5% is not used, the segment 2 interest rate of 6% is used to discount retirement benefits paid from age 65 through age 70, and the segment 3 interest rate of 7% is used to discount benefits paid at age 70 and later. 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 are found in the tables of supplementary factors provided with the examination, for a male participant using 6% and 7% interest.

$$\text{Target normal cost} = \$2{,}174 \times \left[\frac{N^{(12)}_{65@6\%} - N^{(12)}_{70@6\%}}{D_{65@6\%}} v^{15}_{6\%} + \frac{N^{(12)}_{70@7\%}}{D_{65@7\%}} v^{15}_{7\%} \right]$$

$$= \$2{,}174 \times \left[\frac{230{,}685 - 141{,}617}{20{,}994} (0.417265) + \frac{68{,}706}{11{,}403} (0.362446) \right] = \$8{,}596$$

Answer is E.

Question 19

The gain or loss with regard to the death 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 died). 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.

The actual liability is the $10,000 lump sum death benefit.

Smith has accrued a benefit of $10,800 and would have been age 40 on the valuation date of 1/1/2019. It can be assumed that normal retirement age is 65 and the benefit is payable as a life annuity (exam general conditions). The commutation functions used are found in the tables of supplementary factors provided with the examination, for a male participant using 5% interest (the valuation interest rate). Note that the discount for years prior to normal retirement age is based on interest only because the question states that ther are no assumed preretirement decrements.

$$\text{Expected liability} = \$10{,}800 \times \frac{N_{65}^{(12)}}{D_{65}} \times v^{25} = \$10{,}800 \times \frac{463{,}348}{38{,}875} \times 0.295303 = \$38{,}013$$

With no assumed pre-retirement decrements, the probability that Smith died in 2018 is zero, so the value of the expected death benefit for purposes of the expected liability is zero.

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

$X = $38,013 – $10,000 = $28,013

Answer is D.

Question 20

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 segment 3 interest rate, then that segment 3 interest rate is used. In this question, the assumed rate of return for each year of 8.5% is larger than the segment 3 rate for each year, so the segment 3 rate of 5% is used to determine the expected earnings for 2017, and the segment 3 rate of 6% is used to determine the expected earnings for 2018. For purposes of the expected earnings, the benefit payments and expenses are all paid mid-year, and only earn 6 months of interest.

The expected earnings for 2017 are:

$$[400{,}000 \times .05] - [(20{,}000 + 4{,}000) \times (1.05^{6/12} - 1)] = 19{,}407$$

The expected earnings for 2018 are:

$$[500{,}000 \times .06] + [50{,}000 \times (1.06^{9/12} - 1)] - [(25{,}000 + 4{,}500) \times (1.06^{6/12} - 1)] = 31{,}361$$

Note that the 2018 contribution of $30,000, made on 6/1/2019, is a receivable contribution, and is not included in the 2018 expected earnings. However, the discounted value of that receivable contribution, as of 1/1/2019, must be included in the 1/1/2019 asset value (the current market value as well as the market values adjusted from 1/1/2017 and 1/1/2018). The discount is based upon the 2018 plan effective rate of 5.25%.

Discounted receivable contribution for 2018 = $30{,}000/1.0525^{5/12} = 29{,}367$

1/1/2017 adjusted fair market value (adjusted to 1/1/2019)
$$= 400{,}000 + (50{,}000 + 29{,}367) - (20{,}000 + 25{,}000) - (4{,}000 + 4{,}500) + (19{,}407 + 31{,}361) = 476{,}635$$

1/1/2018 adjusted fair market value (adjusted to 1/1/2019)
$$= 500{,}000 + (50{,}000 + 29{,}367) - 25{,}000 - 4{,}500 + 31{,}361 = 581{,}228$$

1/1/2019 adjusted market value = 600,000 + 29,367 = 629,367

1/1/2019 actuarial value = (476,635 + 581,228 + 629,367)/3 = 562,410

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 629,367 is equal to 566,430.

The 1/1/2019 actuarial value of assets is equal to 566,430.

Answer is B.

Question 21

IRC section 430(j)(8) states that in determining the funded percentage for purposes of determining whether a plan is in critical or endangered status, the unit credit cost method is to be used, regardless of the method that the plan uses for purposes of the actuarial valuation.

Answer is A.

Question 22

Treasury regulation 1.430(f)-1(f)(1)(ii)(B) states that when there is a change in a plan's enrolled actuary, any standing election to use a prefunding balance to satisfy the minimum required contribution is no longer in effect. The statement is false.

Answer is B.

Question 23

The 2018 contribution must be discounted using the 2018 plan effective rate of 6% from the date of contribution to 1/1/2018 in order to find the value as of the valuation date.

Discounted value of 2018 contribution = ($16,000,000/$1.06^{6/12}$) = $15,540,574

There is an excess contribution because the discounted value of the 2018 contributions exceeds the minimum required contribution.

2018 excess contribution = $15,540,574 – $15,000,000 = $540,574

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)).

$X = $540,574 × 1.06 = $573,008

Answer is B.

Question 24

IRC section 431(c)(1) states that for a multiemployer plan, the costs and liabilities must be determined under a cost method. In this question, the cost method is Entry Age Normal. It would not be acceptable to determine the cost of ancillary benefits using the Unit Credit cost method. The statement is false.

Answer is B.

Question 25

Revenue Ruling 81-195 prohibits the projection of the IRC section 415 dollar maximum for future cost of living increases for purposes of funding. In 2018, the IRC section 415(b) dollar limit is $220,000. That is the annual accrued benefit that would be used in the 1/1/2018 valuation for purposes of determining the funding target for Smith. The statement is false.

Answer is B.

Question 26

IRC section 430(i)(2)(A) provides that in an at-risk plan, the target normal cost is equal to the target normal cost determined using the at-risk assumptions plus administrative expenses expected to be paid by the plan.

At-risk target normal cost = $250,000 + $8,000 = $258,000

IRC section 430(i)(2)(B) provides for a load of the target normal cost in an at-risk plan when the plan was at risk in at least two of the past four prior years. The four years prior to 2019 are 2015 through 2018. The plan was at-risk in only one of those years (2016), so there is no loading factor to apply in 2019.

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 2018, so for 2019, the target normal cost is equal to 20% of the at-risk target normal cost plus 80% of the not at-risk target normal cost.

Not at-risk target normal cost = $200,000 + $8,000 = $208,000

$X = ($258,000 × 20%) + ($208,000 × 80%) = $218,000

Answer is B.

Question 27

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

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

Each participant's 2018 salary is $50,000, and must be projected to retirement for purposes of the final 3-year average salary. Each participant is age 45 as of 1/1/2019, and the assumed retirement age is 52, so salary will be projected for 5, 6, and 7 years.

$$\text{Final 3-year average salary} = \$50{,}000 \times \frac{1.035^5 + 1.035^6 + 1.035^7}{3} = \$61{,}487$$

Projected normal retirement benefit = 50% × $61,487 = $30,743.50

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.

For the 10 participants:

$$\text{PVFB} = 10 \times \$30{,}743.50 \times \ddot{a}_{52}^{(12)} \times v^7 = 10 \times \$30{,}743.50 \times 11.80 \times 0.622750 = \$2{,}259{,}171$$

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 7% interest rate and the 3.5% salary scale.

Implicit interest rate for amortizing = (1.07/1.035) – 1 = .033816, or 3.3816%

$$\text{NC} = (\text{PVFB} - \text{AVA}) / \ddot{a}_{\overline{7}|.033816} = (\$2{,}259{,}171 - \$450{,}000)/6.349332 = \$284{,}939$$

Answer is D.

Question 28

The annuity substitution rule, as described in Treasury regulation 1.430(d)-1(f)(4)(iii)(B) provides for funding assumptions to be used when a lump sum is assumed to be elected. In this case, the funding segment rates (which are stabilized) are used instead of the IRC section 417 segment rates (which are not stabilized). The statement is false.

Answer is B.

Question 29

The minimum required contribution for 2018 is equal to the sum of the target normal cost and the shortfall amortization charge.

1/1/2018 minimum required contribution = $1,000,000 + $300,000 = $1,300,000

The 2018 contribution must be discounted using the 2018 plan effective rate of 6.5% from the date of contribution to 1/1/2018 in order to find the value as of the valuation date.

Discounted value of 2018 contribution = $1,675,000/$1.065^{6/12}$ = $1,623,080

There is an excess contribution because the discounted value of the 2018 contributions exceeds the minimum required contribution.

2018 excess contribution = $1,623,080 – $1,300,000 = $323,080

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)). The 1/1/2018 prefunding balance is increased with interest using the 2018 actual asset rate of return (see IRC section 430(f)(8)).

1/1/2019 prefunding balance = ($1,500,000 × 1.12) + ($323,080 × 1.06) = $2,024,080

Answer is D.

Question 30

In a cash balance plan, the funding target is determined by increasing the cash balance account using the interest crediting rate to the assumed retirement age, and then discounting it using the segment interest rates. In the case where it is assumed that the form of benefit elected is anything other than a lump sum (e.g. a life annuity), the accumulated cash balance account at assumed retirement age must be converted to an annuity using the plan's cash balance equivalence rates and the funding mortality table and segment rates are then used to determine the present value.

Smith is currently age 50 on 1/1/2019, 15 years before assumed retirement age (retirement age is assumed to be 65 using the exam general conditions). The interest crediting rate is 5%.

Accumulated cash balance/hypothetical account at retirement age = $\$250{,}000 \times 1.05^{15} = \$519{,}732$

Equivalent life annuity payable at age 65 = $\$519{,}732 \div 10.5 = \$49{,}498.29$

The probability of electing a life annuity is given to be 15%, and the probability of electing a lump sum is given to be 85%. These probabilities must be taken into account in determining the present value for the funding target. Note that since Smith is 15 years from retirement, only the segment 2 interest rate of 6% is used to discount the lump sum. For purposes of the life annuity, the segment 2 interest rate of 6% is used to discount retirement benefits paid from age 65 through age 70, and the segment 3 interest rate of 7% is used to discount benefits paid at age 70 and later. There is no statement of pre-retirement mortality, so it can be assumed that mortality is used only post-retirement for purposes of valuing the life annuity (general conditions of the exam). The commutation functions used are found in the tables of supplementary factors provided with the examination, for a <u>female</u> participant using 6% and 7% interest.

Funding target = $(85\% \times \$519{,}732 \div 1.06^{15})$

$$+ (15\% \times \$49{,}498.29 \times \left[\frac{N^{(12)}_{65@6\%} - N^{(12)}_{70@6\%}}{D_{65@6\%}} v^{15}_{6\%} + \frac{N^{(12)}_{70@7\%}}{D_{65@7\%}} v^{15}_{7\%} \right])$$

$$= \$184{,}336 + (15\% \times \$49{,}498.29 \times \left[\frac{242{,}703 - 152{,}525}{21{,}217}(0.417265) + \frac{73{,}593}{11{,}524}(0.362446) \right])$$

$$= \$184{,}336 + \$30{,}353 = \$214{,}689$$

Answer is C.

Question 31

IRC section 412(c)(1)(A) allows a plan sponsor of a single employer plan (assumed in this question per the general conditions of the exam) to obtain a waiver for part of the minimum funding requirement, provided that no waiver is granted for more than 3 of the past 15 years. In this question, a waiver has been granted in only 2 prior years. A waiver can be obtained for the 2019 year. The statement is true.

Answer is A.

Question 32

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 2017 is determined as a new base to be amortized over 15 years beginning on 1/1/2018. Note that this base is established on 1/1/2018, so it is not included in the given amortizations of charges/credits for all bases established before 1/1/2018.

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 $UAL_{1/1/2018}$ = \$770,000 – \$590,000 = \$180,000

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 2017 contribution since it was contributed on the last day of the year).

Expected $UAL_{1/1/2018}$ = [(\$750,000 – \$600,000) + \$70,000] × 1.07 – \$75,000 = \$160,400

There is a loss because the actual UAL exceeds the expected UAL.

2017 Loss = \$180,000 – \$160,400 = \$19,600

Amortization of 2017 loss (charge base) = \$19,600/ $\ddot{a}_{\overline{15}|}$ = \$2,011

Minimum required $\text{contribution}_{12/31/2018}$ = (\$72,000 + \$55,000 – \$15,000 +\$2,011) × 1.07
= \$121,992

The credit balance as of 12/31/2018 is equal to the excess of the sum of the 12/31/2017 credit balance (increased with interest for one year) and the 2018 contribution (which does not receive interest as it was contributed on 12/31/2018) over the minimum required contribution.

$CB_{12/31/2018}$ = (\$250,000 × 1.07) + \$70,000 – \$121,992 = \$215,508

Answer is D.

Question 33

The 2019 contribution made on 4/15/2019 must be discounted using the 2019 plan effective rate of 6% from 4/15/2019 to 1/1/2019.

Discounted value of 4/15/2019 contribution = ($350,000/$1.06^{3.5/12}$) = $344,102

Remaining minimum required contribution (target normal cost plus shortfall amortization charge) to be paid by 9/15/2020 contribution:

$135,000 + $505,000 – $344,102 = $295,898

The quarterly contribution requirement applies under IRC section 430(j)(3)(A) when the FTAP in the prior year is less than 100% (meaning the plan had a funding shortfall in the prior year). The plan had a funding shortfall in 2018 because there are 2018 shortfall amortization charges.

Quarterly contributions are required for 2019. The four quarterly due dates for the 2019 plan year are 4/15/2019, 7/15/2019, 10/15/2019, and 1/15/2020.

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.

90% of 2019 minimum required contribution = 90% × ($135,000 + $505,000) = $576,000

2018 minimum required contribution = $100,000 + $500,000 = $600,000

The quarterly contribution due for each quarter of 2019 is equal to 25% of $576,000 (because 90% of the 2019 minimum required contribution is less than the 2018 minimum):

25% × $576,000 = $144,000

The $350,000 contribution made on 4/15/2019 is enough to satisfy both the 4/15/2019 and the 7/15/2019 quarterly contribution requirements, as well as part of the 10/15/2019 quarterly contribution requirement. The amount of the 10/15/2019 quarterly that is late can be determined by applying the quarterly contributions chronologically to the $350,000 contribution.

Remaining contribution after 4/15/2019 quarterly applied = $350,000 – $144,000 = $206,000

Adjusting with interest at the plan effective rate of 6% to 7/15/2019:

$206,000 × $1.06^{3/12}$ = $209,023

Remaining contribution after 7/15/2019 quarterly applied = \$209,023 – \$144,000 = \$65,023

Adjusting with interest at the plan effective rate of 6% to 10/15/2019:

$\$65{,}023 \times 1.06^{3/12} = \$65{,}977$

Late amount of 10/15/2019 quarterly = \$144,000 – \$65,977 = \$78,023

In addition, the 1/15/2020 quarterly contribution is late.

The final 2019 contribution of \$X is to be made on 9/15/2020, and must be discounted using the 2019 plan effective rate to 1/1/2019. However, when quarterly contributions are late, the amount of the contribution used to satisfy the late quarterlies is discounted by adding 5 percentage points to the plan effective rate (for a total of 11% in this question) from the date the contribution is made back to the quarterly due date, and then using only the plan effective rate (6%) from the quarterly due date to the valuation date (1/1/2019).

Discounted value of late quarterly contributions

$$= (\$78{,}023 \times v_{11\%}^{11/12} \times v_{6\%}^{9.5/12}) + (\$144{,}000 \times v_{11\%}^{8/12} \times v_{6\%}^{12.5/12})$$
$$= \$67{,}708 + \$126{,}412 = \$194{,}120$$

Remaining minimum required contribution to be paid by 9/15/2020 contribution:

\$295,898 – \$194,120 = \$101,778

Balance of 9/15/2020 contribution = $\$101{,}778 \times 1.06^{20.5/12} = \$112{,}431$

Total 9/15/2020 contribution = \$112,431 + \$78,023 + \$144,000 = \$334,454

Answer is C.

Question 34

Treasury regulation 1.430(d)-1(d)(1)(ii) provides that when a plan amendment is adopted after the valuation date (but no later than 2½ months after the plan year end), the plan sponsor may make an election to use the plan amendment in the current year valuation. However, this is an election – there is no requirement to do this. The statement is false.

Answer is B.

Question 35

The 2019 contribution made on 7/1/2019 must be discounted using the 2019 plan effective rate of 5.9% from 7/1/2019 to 1/1/2019.

Discounted value of 7/1/2019 contribution = ($200,000/1.059$^{6/12}$) = $194,349

The funding deficiency is equal to the difference between the minimum required contribution and the discounted contribution actually made.

2019 funding deficiency = $250,000 – $194,349 = $55,651.

The initial excise tax for failure to satisfy minimum funding under IRC section 4971(a)(1) is equal to 10% of the funding deficiency.

$X = 10% × $55,651 = $5,565

Answer is D.

Question 36

The accrued liability under the Projected Unit Credit cost method is equal to the present value of the "projected" accrued benefit based upon accrual service through the first day of the plan year. The "projected" accrued benefit is determined using projected 3-year average salary, using the assumed 1.5% salary scale.

Smith is age 45 with 5 years of past service as of the 1/1/2019 valuation date. The assumed retirement age is 65 (exam general conditions), so salary will be projected for 18, 19, and 20 years.

$$\text{High consecutive 3-year average salary} = \$100{,}000 \times \frac{1.015^{18} + 1.015^{19} + 1.015^{20}}{3} = \$132{,}705$$

"Projected" accrued benefit = 2% × \$132,705 × 5 years = \$13,270.50

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.

$$\$X = \$13{,}270.50 \times \ddot{a}_{65}^{(12)} \times v^{20} = \$13{,}270.50 \times 10.11 \times 0.258419 = \$34{,}671$$

Answer is E.

Question 37

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

The funding shortfall for 2019 is equal to the excess, if any, of the funding target over the actuarial value of the assets (reduced by the funding balances, which do not apply in this question).

The funding shortfall as of 1/1/2019 is:

$2,326,000 – $2,000,000 = $326,000

There are no bases prior to 2019, and so the new shortfall base in 2019 is $326,000. This base is amortized over 7 years. The segment 1 rate is used to amortize the first 5 payments, and the segment 2 rate the final 2 payments.

IRC section 430(h)(2)(C)(iv) requires the segment rates to be stabilized for purposes of the calculation of the minimum required contribution. For plan years that begin in a calendar year through 2020, the funding segment rates must be within a range of 90% to 110% of the 25-month segment rates (determined as of the September 30 prior to the calendar year in which the plan year begins). The given non-stabilized segment rates are all smaller than the corresponding 25-month segment rates, so the 90% corridor must be checked. For each of the 25-month segment rates:

90% of the segment 1 rate = 90% × 4.50% = 4.05%
90% of the segment 2 rate = 90% × 5.50% = 4.95%
90% of the segment 3 rate = 90% × 6.50% = 5.85%

These are each larger than the non-stabilized rates, so the funding rates, with stabilization must be: {4.05%, 4.95%, 5.85%}.

$$\text{Amortization of 2019 shortfall base} = \$326{,}000 \div \left[\ddot{a}_{\overline{5}|4.05\%} + \ddot{a}_{\overline{2}|4.95\%} v^{5}_{4.95\%}\right]$$
$$= \$326{,}000 \div [4.62562 + (1.95283)(0.78539)]$$
$$= \$52{,}928$$

Minimum required contribution as of 1/1/2019 = $80,000 + $52,928 = $132,928

Answer is B.

Question 38

The expected unfunded liability in an immediate gain method, such as Unit Credit, equals 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 2019 contribution since it was contributed on the last day of the year).

Expected $UAL_{1/1/2020}$ = [($150,000 – $0) + $50,000] × 1.06 – $125,000 = $87,000

Answer is B.

Question 39

The experience gain or loss due to termination of employment is equal to the difference between the actual liability upon termination of employment and the accumulated funding target plus target normal cost had the participant not terminated (expected liability), accumulated to the date of termination.

Smith is age 45 with 21 years of service as of the 12/31/2018 termination date. The assumed retirement age is 65 (exam general conditions), so benefits will be discounted for 20 years. Only the segment 3 rate is used to value the benefit for Smith (for purposes of the expected liability) because Smith is at least 20 years from retirement age (exactly 20 in this case). The IRC section 417(e) applicable interest rates and commutation functions are used to determine the present value of the lump sum benefit elected by Smith.

12/31/2018 accrued benefit = $75 × 21 years = $1,575

Actual liability = $1,575 × 12 × $\frac{N_{65}^{(12)}}{D_{45}}$ = $18,900 × (477,312/109,888) = $82,094

The segment 3 rate of 6% for IRC section 430 is used to accumulate the funding target and target normal cost from 1/1/2018 because Smith was more than 20 years (21 years) from retirement as of that date, and only the segment 3 rate would have been used to determine both the funding target and target normal cost.

Expected liability = ($56,000 + $2,500) × 1.06 = $62,010

There is a loss because the actual liability is greater than the expected liability.

$X = $82,094 – $62,010 = $20,084 loss

Answer is C.

Question 40

The funding target is equal to the present value of the benefit accrued as of the first day of the year. Smith is age 60 on 1/1/2019, with 15 years of service.

1/1/2019 accrued benefit = 1.4% × \$90,000 × 15 years of service = \$18,900

The normal form of benefit is a life annuity with 5 years certain, so the annuity factor for the 5-year certain period must be calculated. Those benefits will be paid from age 65 through 70 (the 6th through 10th years from Smith's current age of 60), so the segment 2 interest rate of 6% is used.

The equivalent monthly effective rate is:

$1.06^{1/12} - 1 = 0.004868$, or 0.4868%

$$\ddot{a}^{(12)}_{\overline{5}|6\%} = \tfrac{1}{12}\ddot{a}_{\overline{60}|0.4868\%} = 4.348$$

The life only portion of Smith's benefit will be paid beginning at age 70, and the segment 2 interest rate of 6% is used to discount retirement benefits paid from age 70 through age 80, with the segment 3 interest rate of 7% is used to discount benefits paid at age 80 and later. 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 are found in the tables of supplementary factors provided with the examination, for a <u>male</u> participant using 6% and 7% interest.

The funding target is:

$$\$X = \$18{,}900 \times \left[(4.348 + \frac{N^{(12)}_{70@6\%} - N^{(12)}_{80@6\%}}{D_{65@6\%}}) v^5_{6\%} + \frac{N^{(12)}_{80@7\%}}{D_{65@7\%}} v^5_{7\%} \right]$$

$$= \$18{,}900 \times \left[(4.348 + \frac{141{,}617 - 39{,}371}{20{,}994})(0.747258) + \frac{17{,}772}{11{,}403}(0.712986) \right] = \$151{,}193$$

Answer is B.

Question 41

IRC section 430(f)(8) states that in order to determine the prefunding balance as of the first day of a plan year, the unused balance from the prior year is adjusted using the actual asset rate of return for that prior year. The actual rate of asset return is based upon market value of assets, not actuarial value of assets. The statement is false.

Answer is B.

Question 42

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

The funding shortfall as of 1/1/2019 is equal to the excess, if any, of the funding target over the actuarial value of the assets (reduced by the prefunding balance and the funding standard carryover balance). The funding shortfall cannot be less than zero. There are no funding balances in this question.

For purposes of the 1/1/2019 actuarial value of assets, the 1/1/2018 asset value and the 2018 contribution made during 2018 are adjusted using the actual rate of return (the 9/1/2018 contribution receiving only 4 months of interest). The receivable contribution for 2018 made during 2019 is discounted to 1/1/2019 using the 2018 plan effective rate.

Assuming a negative 3% return on the 2018 assets,

$$AVA_{1/1/2019} = (\$650{,}000 \times 0.97) + (\$40{,}000 \times 0.97^{4/12}) + (\$100{,}000 \times v_{5.5\%}^{5/12})$$
$$= \$630{,}500 + \$39{,}596 + \$97{,}794 = \$767{,}890$$

The funding shortfall (which cannot be less than zero) as of 1/1/2019 is:

$\$750{,}000 – \$767{,}890 = \$0$

It is not known whether there were any shortfall amortization bases prior to 2019, but with a funding shortfall of zero they would all be deemed fully amortized. With a funding shortfall of $0 there is also no new base this year.

In addition, when the actuarial value of assets reduced by the funding balances exceeds the funding target, the target normal cost is reduced by the amount of the excess (IRC section 430(a)(2)).

$X = **Minimum required contribution** as of 1/1/2019 = $\$77{,}000 – (\$767{,}890 – \$750{,}000) = \$59{,}110$

Assuming a positive 6% return on the 2018 assets,

$AVA_{1/1/2019} = (\$650{,}000 \times 1.06) + (\$40{,}000 \times 1.06^{4/12}) + (\$100{,}000 \times v_{5.5\%}^{5/12})$
$= \$689{,}000 + \$40{,}785 + \$97{,}794 = \$827{,}579$

The funding shortfall as of 1/1/2019 is:

$\$750{,}000 – \$827{,}579 = \$0$

$Y = **Minimum required contribution** as of 1/1/2019 = $\$77{,}000 – (\$827{,}579 – \$750{,}000) = \$0$

Note that the minimum required contribution cannot be less than $0.

$X – $Y = $59,110 – $0 = $59,110

Answer is C.

Question 43

With the proposed delay in the start of medical benefits for retirees to age 65, and the fact that the experience shows that the availability of medical benefits is important to retirees, it should be expected that the average retirement age will increase from the current age 63. Only retirement rates table II reflects this expectation. Therefore, II would be the most reasonable of the given possibilities of retirement rate assumptions for the 1/1/2019 valuation.

Answer is B.

Question 44

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.

Condition (3) is satisfied as the plan had 990 participants on 12/31/2018.

The funding target attainment percentage (FTAP) is equal to the ratio of the actuarial value of assets (reduced by the funding balances) to the funding target (IRC section 430(d)(2)).

Without the additional at-risk funding assumptions:

FTAP = ($1,500,000 – $3,000)/$2,100,000 = 78.79%

Condition (1) is satisfied.

With the additional at-risk funding assumptions:

FTAP = ($1,500,000 – $3,000)/$1,900,000 = 71.29%

Condition (2) is not satisfied.

All three conditions must be satisfied for the plan to be at-risk, so it is not at-risk for 2019. The statement is false.

Answer is B.

Question 45

The funding target is equal to the present value of the benefit accrued as of the first day of the year. For purposes of the funding target, compensation cannot be projected for assumed future increases.

$$\text{Actual high consecutive 3-year average compensation} = \frac{\$50{,}000 + \$52{,}000 + \$58{,}000}{3} = \$53{,}333$$

$$\text{Expected high consecutive 3-year average compensation} = \frac{\$50{,}000 + \$52{,}000 + (\$52{,}000 \times 1.05)}{3}$$
$$= \$52{,}200$$

Excess of actual average compensation over expected = \$53,333 – \$52,200 = \$1,133

Smith is age 45 with 19 years of service as of the 1/1/2019 valuation date. The assumed retirement age is 65 (exam general conditions), so benefits will be discounted for 20 years. Only the segment 3 rate is used to value the benefit for Smith because Smith is at least 20 years from retirement age (exactly 20 in this case). 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 are found in the tables of supplementary factors provided with the examination, for a male participant using 5% interest.

$$\$X = 1.75\% \times \$1{,}133 \times 19 \text{ years of service} \times \frac{N^{(12)}_{65@5\%}}{D_{65@5\%}} v^{20}_{5\%}$$
$$= \$376.72 \times (463{,}348/38{,}875) \times (0.376889) = \$1{,}692$$

Answer is B.

Question 46

The minimum required contribution under the projected unit credit cost method is equal to the normal cost plus the amortization of the various charge bases less the amortization of the various credit bases. The smallest amount that satisfies the minimum funding standard is equal to the excess of the minimum required contribution over the credit balance. This difference is increased with interest using the valuation interest rate to the end of the plan year (12/31/2019).

The 2018 actuarial loss of $13,000 is amortized over 15 years, beginning on 1/1/2019 (IRC section 431(b)(2)(B)(iii)). The increase in liability of $15,000 due to the plan amendment is generally amortized over 15 years, beginning on 1/1/2019 (IRC section 431(b)(2)(B)(ii)). However, IRC section 431(b)(7)(G) requires that for plan amendments that provide for short term benefits, the amortization base resulting from the plan amendment is amortized only over the period that the benefits will be paid (if less than 15 years). In this case, the benefits to the retirees are paid for only two years, resulting in a 2-year amortization of the plan amendment base.

The **smallest amount that satisfies the minimum funding standard** is:

$$\$X = (\$20{,}000 + \frac{\$45{,}000}{\ddot{a}_{\overline{10}|}} - \frac{\$8{,}000}{\ddot{a}_{\overline{14}|}} + \frac{\$13{,}000}{\ddot{a}_{\overline{15}|}} + \frac{\$15{,}000}{\ddot{a}_{\overline{2}|}} - \$2{,}500) \times 1.065$$

$$= (\$20{,}000 + \$5{,}878 - \$833 + \$1{,}298 + \$7{,}736 - \$2{,}500) \times 1.065 = \$33{,}632$$

Answer is B.

Question 47

The 2018 contribution must be discounted using the 2018 plan effective rate of 6% from the date of contribution to 1/1/2018 in order to find the value as of the valuation date.

Discounted value of 2018 contribution = ($700,000/$1.06^{18/12}$) = $641,415

There is an excess contribution because the discounted value of the 2018 contribution exceeds the minimum required contribution.

2018 excess contribution = $641,415 – $500,000 = $141,415

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

In addition, the employer has elected to use $10,000 of the prefunding balance to help pay for the minimum required contribution, which results in an additional excess contribution of $10,000.

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)). However, Treasury regulation 1.430(f)-1(b)(3)(iii) requires that to the extent that part of the excess contribution came from an election to use a funding balance to pay for the minimum required contribution, that part of the excess contribution is increased using the asset rate of return for the year instead of the plan effective rate. So, the $10,000 excess contribution due to the election to use the prefunding balance is increased using the 2018 asset return rate of 3%, and the $141,415 actual excess contribution is increased using the plan effective rate of 6%. The remaining 1/1/2018 prefunding balance of $170,000 is increased with interest using the 2018 actual asset rate of return (see IRC section 430(f)(8)).

1/1/2019 prefunding balance = ($170,000 × 1.03) + ($141,415 × 1.06) + ($10,000 × 1.03) = $335,300

Answer is C.

Question 48

IRC section 4971(a)(1) provides that in the case of a single employer plan (assumed under the general conditions of the exam), the initial excise tax for unpaid minimum required contributions is equal to 10% of the unpaid contribution.

10% × $110,000 = $11,000

The statement is true.

Answer is A.

Question 49

The plan sponsor may elect to apply a portion of a funding balance to pay for the minimum required contribution (including required quarterly contributions), provided that the funded percentage for the prior year is at least 80% (IRC section 430(f)(3)(C). The funded percentage is equal to the ratio of the actuarial value of assets (reduced by the prefunding balance) to the funding target.

$$\text{1/1/2018 funded percentage} = \frac{\$8{,}000{,}000 - \$400{,}000}{\$9{,}600{,}000} = 79.2\%$$

The employer may not elect to use any of the 2019 prefunding balance to pay for the 2019 required quarterly contributions. The statement is false.

Answer is B.

Question 50

Treasury regulation 1.430(f)-1(f)(2)(i) requires that any election to use the prefunding balance to offset the minimum required contribution for a plan year be made by the minimum funding due date for that plan year. IRC section 430(j)(1) states that the minimum funding due date is 8½ months after the end of a plan year. For the 2019 calendar plan year, that date would be 9/15/2020. The statement is true.

Answer is A.

Question 51

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 62 with 14 years of service.

12/31/2018 accrued benefit = \$125 × 14 years of service = \$1,750

The reduced accrued benefit payable at age 62 is:

\$1,750 × [1 – (3% × 3 years)] = \$1,592.50

Smith has elected to receive the benefit in the form of a 10-year certain and life annuity.

10-year certain and life annuity payable at age 62 = \$1,592.50 × 0.90 = \$1,433.25

The 10-year certain annuity factor is not provided, so it must be determined based upon the annual valuation interest rate of 7%. The equivalent effective monthly interest rate is:

$1.07^{1/12} - 1 = 0.00565415$, or 0.565415%

$$\ddot{a}^{(12)}_{\overline{10}|7\%} = \tfrac{1}{12} \times \ddot{a}_{\overline{120}|0.565415\%} = 7.2871$$

$$\text{Actual liability} = \$1{,}433.25 \times 12 \times \left(\ddot{a}^{(12)}_{\overline{10}|7\%} + \frac{N^{(12)}_{72@7\%}}{D_{62@7\%}}\right) = \$17{,}199 \times \left(7.2871 + \frac{59{,}195}{14{,}408}\right) = \$195{,}993$$

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

For purposes of the unit credit accrued liability, the assumed retirement age is 65 and the assumed form of benefit is a life annuity (exam general conditions).

$$\text{Expected liability} = \$1{,}750 \times 12 \times \frac{N^{(12)}_{65@7\%}}{D_{62@7\%}} = \$21{,}000 \times \frac{121{,}532}{14{,}408} = \$177{,}136$$

\$X = \$195,993 – \$177,136 = \$18,857

Answer is B.

Question 52

The deductible limit under IRC section 404(a)(1)(A) for a multiemployer defined benefit plan is generally equal to the greater of the minimum required contribution (reduced by any credit balance) or the normal cost plus limit adjustment, with the limit adjustment being equal to the 10-year amortization of the 404 bases. Regardless of the valuation date, the deductible limit for multiemployer plans is determined as of the last day of the year, so all valuation items must be increased with interest at the valuation rate of 6.5% to 12/31/2019.

Minimum required contribution (as of end of year) = ($1,400,000 – $100,000) × 1.065 = $1,384,500

Normal cost plus limit adjustment (as of end of year) = ($600,000 + $80,000) × 1.065 = $724,200

The greater of these two amounts is $1,384,500.

The normal cost plus limit adjustment is limited, if necessary, by the full funding limitation (greater of the ERISA full funding limitation or the RPA'94 full funding limitation). The data needed to determine the full funding limitation has been provided. The ERISA full funding limit is equal to the sum of the Entry Age Normal accrued liability and normal cost, and reduced by the smaller of the market or actuarial value of the assets (unlike for minimum funding, this is <u>not</u> reduced by the credit balance in the funding standard account for purposes of the deductible limit). Those results are then increased with valuation interest (6.5%) to the end of the year.

The ERISA full funding limit is:

($5,000,000 + $600,000 – $4,000,000) × 1.065 = $1,704,000

Note that when there are benefit payments during the year, both the liabilities and assets are reduced by those benefit payments. However, since the assets are subtracted from the liabilities, the net result would be the same, and so the benefit payments have been ignored.

The ERISA full funding limit is much larger than the normal cost plus limit adjustment, so the full funding limitation does not apply. Note that there is no need to determine the RPA'94 full funding limitation, as it can only serve to increase the full funding limit, which already has no impact.

Finally, IRC section 404(a)(1)(D) allows for a deductible limit of 140% of current liability (including the expected increase in current liability due to benefits accruing during the year) reduced by the actuarial value of assets (all determined as of the last day of the year). The current liability is adjusted with interest using the current liability interest rate of 4%, and the actuarial value of assets is adjusted with interest using the valuation interest rate of 6.5%. In addition, the assets must be reduced by the expected benefit payments (adjusted with valuation interest) and the current liability must be reduced by the expected release from current liability (adjusted with current liability interest).

$$140\% \times \{[(\$3{,}750{,}000 + \$550{,}000) \times 1.04] - (\$80{,}000 \times 1.02)\} - [(\$4{,}200{,}000 \times 1.065) - (\$75{,}000 \times 1.0325)] = \$1{,}750{,}998$$

Note that either simple interest or compound interest can be used to accumulate the mid-year expected payments.

The deductible limit is equal to the IRC section 404(a)(1)(D) amount, as that is larger than the greater of the minimum required contribution or the normal cost plus limit adjustment. The deductible limit is $1,750,998.

Answer is C.

Note that the deductible limit under IRC section 404(a)(1)(A) is limited by the full funding limit. However, the deductible limit under IRC section 404(a)(1)(D) is not limited by the full funding limit. So, it was not necessary to calculate the full funding limit in this question.

Question 53

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 1/1/2019 market value of assets is equal to ¾ of the gain/loss during 2018, plus/minus ½ (two-fourths) of the gain/loss during 2017, plus/minus ¼ of the gain/loss during 2016. Losses are added, and gains are subtracted. The asset gain/loss has been provided for each year.

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.

$AVA_{1/1/2019}$ = \$1,350,000 + (¾ × \$600,000) – (½ × \$400,000) + (¼ × \$310,000)
= \$1,677,500, but not more than \$1,620,000 (\$1,350,000 × 120%)

The actuarial value of assets as of 1/1/2019 is $1,620,000.

Answer is D.

Question 54

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.

This 2018 waived deficiency is amortized under IRC section 430(e) over a period of 5 years, beginning with 2019. The amortization is based upon the 2018 segment rates (the year in which the deficiency was waived). The segment 1 rate applies to the first 4 payments (from 1/1/2019 through 1/1/2022) and the segment 2 rate applies to the final payment on 1/1/2023. Note the use of an annuity-immediate because the first payment is on 1/1/2019, one year after the waived deficiency is created.

Amortization of 2018 waived deficiency = $\frac{\$245{,}000}{a^{-}_{\overline{4}|5\%} + v^{5}_{6\%}} = \$57{,}067$

2019 **minimum required contribution** = \$150,000 + \$85,000 + \$57,067 = \$292,067

Answer is D.

Question 55

Treasury regulation 1.430(d)-1(f)(4)(ii)(B) requires that for funding purposes, a lump sum must be valued using the IRC section 417(e) mortality (post-retirement) and using the IRC section 430(h) funding segment rates. The funding target as of 1/1/2019 would be determined using only the IRC section 417(e) applicable mortality table, but not the applicable interst rates. The IRC section 430(h) funding interest rates are used. The statement is false.

Answer is B.

Question 56

The accrued liability under the unit credit cost method is equal to the present value of the benefit accrued to date. Smith is age 54 with 19 years of service as of 1/1/2019.

1/1/2019 accrued benefit = \$200 × 19 years of service = \$3,800

1/1/2019 unit credit accrued liability = $\$3{,}800 \times 12 \times \ddot{a}_{65}^{(12)} \times v^{11}$
$= \$45{,}600 \times 10.99 \times 0.526788 = \$263{,}996$

The accrued liability under the entry age normal funding method is equal to the accumulated value of the prior normal costs (as of the 1/1/2019 valuation date). The normal costs are 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. Smith will have 30 years of service at age 65.

Projected benefit = \$200 × 30 years of service = \$6,000

The present value of future benefits (PVFB) must be determined at entry age (age at hire). Smith was hired at age 35. 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).

$PVFB_{35} = \$6{,}000 \times 12 \times \ddot{a}_{65}^{(12)} \times v^{30} = \$72{,}000 \times 10.99 \times 0.174110 = \$137{,}770$

The normal cost is equal to the PVFB amortized over the total years to retirement.

$NC = PVFB_{35} / \ddot{a}_{\overline{30}|.06} = \$137{,}770/14.590721 = \$9{,}442.30$

The accrued liability is equal to the accumulation of the past normal costs through Smith's current age on 1/1/2019 (19 years of accumulation from age 35 to 54).

$AL = NC \times \ddot{s}_{\overline{19}|.06} = \$9{,}442.30 \times 35.785591 = \$337{,}898$

The difference between the accrued liabilty under the two cost methods is:

\$X = \$337,898 – \$263,996 = \$73,902

Answer is B.