

Solutions to EA-2(F) Examination Fall, 2014

Question 1

The funding target for a plan participant is equal to the present value as of the valuation date of the benefit accrued as of the first day of the plan year. In this question, the accrued benefit is the \$1,000 supplemental benefit payable until age 62. When there are various assumed retirement ages, the present value must include the sum of the values 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 60 and 61. The assumed probability of retiring at each age is:

Age 60: 35%

Age 61: 65% (probability of NOT retiring at age 60) \times 25% = 16.25%

Each payment will be made within the next two years, so only the segment 1 interest rate of 5% is used to determine the present value (segment 1 is used for payments made within the next 5 years from the valuation date).

Treasury regulation 1.430(d)-1(c)(1)(ii) requires that for purposes of the funding target, if a benefit is a flat benefit (not accrued incrementally over service or plan participation), then it must be pro-rated based upon service to date and service at retirement. Smith has 20 years of service at age 60, and would be fully accrued if he retired at age 60. However, if Smith does not retire until age 61, the pro-ration of the \$1,000 supplemental benefit would be 20/21. That must be used to determine the present value for retirement at age 61.

Note that since there are no assumed preretirement decrements, there is an interest only discount from age 61 back to age 60 in the determination of the funding target with regard to the assumed retirement at age 61.

Finally, the commutation functions used are found in the tables of supplementary factors provided with the examination, for a male participant using 5% interest.

The funding target with respect to each possible retirement age is:

$$\text{Age 60: } 35\% \times 1,000 \times 12 \times \frac{N_{60@5\%}^{(12)} - N_{62@5\%}^{(12)}}{D_{60}} = 4,200 \times \frac{684,044 - 586,684}{51,213} = 7,985$$

$$\begin{aligned} \text{Age 61: } & 16.25\% \times 1,000 \times 12 \times (20/21) \times \frac{N_{61@5\%}^{(12)} - N_{62@5\%}^{(12)}}{D_{61}} \times v_{5\%} \\ & = 1,950 \times (20/21) \times \frac{634,053 - 586,684}{48,545} \times 0.9524 = 1,726 \end{aligned}$$

$$\text{Funding target} = 7,985 + 1,726 = 9,711$$

Answer is B.

Question 2

When an employer elects to apply funding balances towards the minimum required contribution, the funding standard carryover balance must be used before the prefunding balance can be used. The entire \$15,000 elected to be applied to the minimum required contribution in this question comes from the funding standard carryover balance. The \$75,000 prefunding balance is adjusted from 1/1/2015 to 1/1/2016 using the actual asset rate of return for 2015, which is a 5% loss.

$$\text{Adjusted prefunding balance} = \$75,000 \times 0.95 = \$71,250$$

The \$115,000 contribution for 2015 made on 12/1/2015 must be discounted to 1/1/2015 (the valuation date) using the effective interest rate of 6%:

$$\$115,000 \times v_{6\%}^{11/12} = \$115,000 \times 0.947988 = \$109,019$$

There is an excess contribution of \$9,019. The general conditions of the exam state that the employer elects to add excess contributions to the prefunding balance. This is done as of the first day of the following plan year (1/1/2016), and the excess contribution is increased with interest using the 2015 effective interest rate.

$$\text{Addition to prefunding balance} = \$9,019 \times 1.06 = \$9,560$$

Finally, the \$15,000 that was elected to be used to apply to the minimum required contribution was not needed to avoid a funding deficiency. As a result, it is added to the prefunding balance as of 1/1/2016 (the next plan year beginning date), with interest. However, since it was not used to reduce the minimum required contribution, it is increased with the actual rate of return for 2015 (as it would have been increased that way had it not been elected to be used to apply to the minimum). See Treasury regulation 1.430(f)-1(b)(3)(iii).

$$\$15,000 \times 0.95 = \$14,250$$

$$1/1/2016 \text{ prefunding balance} = \$71,250 + \$9,560 + \$14,250 = \$95,060$$

Answer is C.

Question 3

The normal cost under the projected unit credit method is equal to the present value of the increase in the accrued benefit for the year, including future assumed compensation increases. Smith is age 40 on 1/1/2015, and will have 25 years of future salary increases. 2015 is Smith's 11th year of service, so the service cap in the benefit formula does not apply.

$$\text{Projected salary for Smith} = \$77,000 \times 1.03^{25} = \$161,221$$

This does not exceed the IRC section 401(a)(17) compensation limit for 2015 (which can be assumed to be equal to the 2014 limit of \$260,000).

$$\text{Accrual for 2015 based on projected salary} = 2\% \times \$161,221 = \$3,224.42$$

$$\text{Normal cost} = \$3,224.42 \times 10.11 \times v_{7\%}^{25} = \$3,224.42 \times 10.11 \times 0.184249 = \$6,006$$

Answer is B.

Question 4

The minimum required contribution under the unit credit cost method is equal to the normal cost plus amortization charges less amortization credits. This is offset by any existing credit balance to determine the **smallest amount that satisfies the minimum funding standard**.

A new amortization base is created when there is a plan amendment affecting benefits, and this is amortized over 15 years. The new amortization base is equal to the increase in the accrued liability due to the plan amendment. The accrued liability is given prior to the plan amendment, so the accrued liability after the plan amendment is equal to the pre-amendment accrued liability multiplied by the ratio of the new early retirement reduction factor at age 62 to the old early retirement reduction factor at age 62. Note that all active participants are under age 60, so none have reached age 62 as of the valuation date of 1/1/2015. The other participants are not affected by the plan amendment.

$$\begin{aligned}\text{Early retirement reduction factor (old plan)} &= 1 - (5\% \times 3 \text{ years}) = 0.85 \\ \text{Early retirement reduction factor (new plan)} &= 1 - (3\% \times 3 \text{ years}) = 0.91\end{aligned}$$

$$\begin{aligned}\text{Accrued liability (before amendment)} &= 1,170,000 + 410,000 = 1,580,000 \\ \text{Accrued liability (after amendment)} &= [1,170,000 \times (0.91/0.85)] + 410,000 = 1,662,588\end{aligned}$$

$$\text{Increase in accrued liability} = 1,662,588 - 1,580,000 = 82,588$$

Similarly, the normal cost after the amendment is equal to the normal cost before the amendment multiplied by the ratio of the new early retirement reduction factor at age 62 to the old early retirement reduction factor at age 62. Only active participants have a normal cost under the unit credit method.

$$\text{Normal cost (after amendment)} = 240,000 \times (0.91/0.85) = 256,941$$

$$\begin{aligned}\text{Minimum required contribution as of 1/1/2015} &= 256,941 + 140,000 - 60,000 + \frac{82,588}{\ddot{a}_{15|}} \\ &= 256,941 + 140,000 - 60,000 + 8,475 \\ &= 345,416\end{aligned}$$

Smallest amount that satisfies the minimum funding standard as of 12/31/2015

$$= (345,416 - 15,000) \times 1.07 = 353,545$$

Answer is D.

Question 5

In order to determine excess contribution amounts, the contributions made must be interest adjusted using the plan effective rate from the date they are made to the valuation date. The \$300,000 contribution is adjusted for 6 months, and the \$200,000 contribution is adjusted for 18 months.

$$\begin{aligned} \$300,000/1.062^{6/12} &= \$291,111 \\ \$200,000/1.062^{18/12} &= \$182,744 \end{aligned}$$

$$\text{Interest-adjusted contributions for 2015} = \$291,111 + \$182,744 = \$473,855$$

The excess contribution is:

$$\$473,855 - \$260,000 = \$213,855$$

The general conditions of the exam state that the employer elects to add excess contributions to the prefunding balance. This is done as of the first day of the following plan year (1/1/2016), and the excess contribution is increased with interest using the 2015 effective interest rate.

$$\text{Addition to prefunding balance} = \$213,855 \times 1.062 = \$227,114$$

When an employer elects to apply funding balances towards the minimum required contribution, the funding standard carryover balance must be used before the prefunding balance. So, of the \$250,000 that is elected to be applied towards the 2015 minimum required contribution, the entire funding standard carryover balance of \$170,000 is used and \$80,000 of the prefunding balance is used.

The \$250,000 that was elected to be used to apply to the minimum required contribution was not needed to avoid a funding deficiency. As a result, it is added to the prefunding balance as of 1/1/2016 (the next plan year beginning date), with interest. However, since it was not used to reduce the minimum required contribution, it is increased with the actual rate of return for 2015 (as it would have been increased that way had it not been elected to be used to apply to the minimum). See Treasury regulation 1.430(f)-1(b)(3)(iii).

$$\$250,000 \times 1.225 = \$306,250$$

$$\$X = \$227,114 + \$306,250 = \$533,364$$

Answer is D.

Question 6

- I. There are no amortization bases under the Aggregate cost method (other than regulatory bases such as for waived deficiencies). An increase in plan liability such as for an increased preretirement death benefit is funded through an increased normal cost under this method, not over a 15-year period. The statement is false.
- II. Since there are no amortization bases under the Aggregate cost method, this statement is false.
- III. Actuarial assumption changes are based upon facts and circumstances, and are not required merely because of a plan amendment increasing liabilities or adding additional benefits. The statement is false.

Answer is A.

Question 7

This statement is true. See IRC section 412(d)(2).

Answer is A.

Question 8

The target normal cost is equal to the present value of the increase in the accrued benefit for the year. For this purpose, the beginning of year accrued benefit uses salary history through the end of the prior year, and the end of year accrued benefit uses salary history through the end of the prior year as well as current year expected salary (equal to the prior year salary increased by the assumed salary scale). The funding target is equal to the present value of the accrued benefit in effect at the beginning of the year (using salary history through the end of the prior year).

Smith has 3 years of service as of 1/1/2014 and 4 years of service as of 12/31/2014.

Compensation used to determine benefits must be limited under IRC section 401(a)(17). The 2011 compensation for Smith must be limited to \$245,000, the 2012 compensation must be limited to \$250,000, and the 2013 compensation is not limited because it is less than the 2013 compensation limit of \$255,000. The 2014 projected compensation for Smith is \$252,350 ($\$245,000 \times 1.03$), and it is not limited because it is less than the 2014 compensation limit of \$260,000.

$$\text{High 3-year average compensation}_{1/1/2014} = \frac{\$245,000 + \$250,000 + \$245,000}{3} = \$246,667$$

$$\begin{aligned} \text{High 3-year average compensation}_{12/31/2014} \\ = \frac{\$250,000 + \$245,000 + \$252,350}{3} = \$249,117 \end{aligned}$$

$$\text{Accrued benefit as of 1/1/2014} = 3\% \times \$246,667 \times 3 \text{ years of service} = \$22,200$$

$$\text{Accrued benefit as of 12/31/2014} = 3\% \times \$249,117 \times 4 \text{ years of service} = \$29,894$$

The limitation of IRC section 415 must be considered with regard to both the beginning and end of year accrued benefits. Smith entered the plan on 1/1/2013 and has only one year of plan participation as of 1/1/2014. The IRC section 415 dollar limit for 2014 is \$210,000. This is reduced when years of plan participation are less than 10, as is the case for Smith.

$$1/1/2014 \text{ IRC section 415 dollar limit} = \frac{1}{10} \times \$210,000 = \$21,000$$

$$12/31/2014 \text{ IRC section 415 dollar limit} = \frac{2}{10} \times \$210,000 = \$42,000$$

The 1/1/2014 accrued benefit for Smith must be limited to \$21,000. The 12/31/2014 accrued benefit is not affected by IRC section 415.

$$\text{Benefit for purposes of the 2014 target normal cost} = \$29,894 - \$21,000 = \$8,894$$

It is assumed based upon the general conditions of the exam that normal retirement age is 65. Smith is currently age 64 on 1/1/2014. The segment 1 interest rate of 5% (applicable to payments made during the first 5 years from the valuation date) is applicable for Smith's annual payments from age 65 and prior to age 69 (the payment at age 69 is discounted using the segment 2 rate because it is made at the beginning of the 6th year from the valuation date). The segment 2 interest rate of 6% (applicable to payments that begin at least 5 years and no more than 20 years from the valuation date) is applicable for Smith's payments beginning at age 69 and prior to age 84. The segment 3 interest rate of 7% (applicable to payments that begin at least 20 years from the valuation date) is applicable for Smith's benefit payments beginning at age 84.

Note that since there are no assumed preretirement decrements (this is an exam general condition, and no preretirement decrement is mentioned in this question), there is an interest only discount from age 65 to age 64 in the determination of the target normal cost.

The commutation functions used are found in the tables of supplementary factors provided with the examination, for a female participant using 5%, 6%, and 7% interest.

Target normal cost

$$\begin{aligned}
 &= \$8,894 \times \left[\frac{N_{65@5\%}^{(12)} - N_{69@5\%}^{(12)}}{D_{65@5\%}} v_{5\%} + \frac{N_{69@6\%}^{(12)} - N_{84@6\%}^{(12)}}{D_{65@6\%}} v_{6\%} + \frac{N_{84@7\%}^{(12)}}{D_{65@7\%}} v_{7\%} \right] \\
 &= \$8,894 \times \left[\frac{488,388 - 347,839}{39,304} v_{5\%} + \frac{167,356 - 25,502}{21,225} v_{6\%} + \frac{11,104}{11,529} v_{7\%} \right] \\
 &= \$94,373
 \end{aligned}$$

Answer is B.

Question 9

The retirement rates described in set III would not be appropriate because the average age of retirement is 59, not 62, as the experience would indicate should be used.

Since retirement has occurred at all ages from 55 to 65, set I would be a better representation of the experience than set II, which does not assume any retirements at ages 55, 56, 62 and 64.

Set I is the best choice.

Answer is A.

Question 10

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

The target normal cost is equal to the present value of the 2015 benefit accrual (including an assumed 3% salary increase for 2015 in the determination of the end of year accrued benefit), and the funding target is equal to the present value of the 1/1/2015 accrued benefit. Smith is age 43 on 1/1/2015, and retirement age is assumed to be age 65 (general conditions of the exam). Only the segment 3 interest rate of 7% is used to determine the present value, because Smith has more than 20 years before reaching the assumed retirement age.

Smith has 15 years of service as of 1/1/2015 and 16 years of service as of 12/31/2015.

1/1/2015 accrued benefit = $1.5\% \times \$100,000 \times 15$ years of service = \$22,500

12/31/2015 accrued benefit = $1.5\% \times (\$100,000 \times 1.03) \times 16$ years of service = \$24,720

$$\begin{aligned}\text{Target normal cost} &= (\$24,720 - \$22,500) \times \ddot{a}_{65@7\%}^{(12)} \times v_{7\%}^{22} \\ &= \$2,220 \times 10.11 \times 0.225713 = \$5,066\end{aligned}$$

$$\begin{aligned}\text{Funding target} &= \$22,500 \times \ddot{a}_{65@7\%}^{(12)} \times v_{7\%}^{22} \\ &= \$22,500 \times 10.11 \times 0.225713 = \$51,344\end{aligned}$$

The funding shortfall for 2015 is 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).

$$\text{Funding shortfall}_{1/1/2015} = \$51,344 - (\$55,000 - \$1,000 - \$5,000) = \$2,344$$

IRC section 430(c)(5)(A) states that a plan is exempt from creating a new shortfall amortization base only if the plan's assets reduced by the prefunding balance (if the employer elects to use any portion of the prefunding balance to reduce the minimum required contribution) is at least as large as the funding target. The funding standard carryover balance is never used in this situation. In this question, there is a prefunding balance, but the employer has not elected to use it to reduce the minimum required contribution. The actuarial value of assets unreduced by the funding balances exceeds the funding target, so the plan is exempt from creating a new shortfall amortization base in 2015. There were no shortfall bases in the prior plan years.

The minimum required contribution for 2015 is equal to the target normal cost of \$5,066.

Answer is D.

Question 11

In order to determine excess contribution amounts, the contributions made must be interest adjusted using the plan effective rate from the date they are made to the valuation date. The \$150,000 contribution is adjusted for 13 months.

$$\$150,000/1.06^{13/12} = \$140,824$$

The excess contribution for 2014 is: $\$140,824 - \$100,000 = \$40,824$

The general conditions of the exam state that the employer elects to add excess contributions to the prefunding balance. This is done as of the first day of the following year (1/1/2015), and the excess contribution is increased with interest using the effective interest rate for the current year of 6%.

$$\text{Addition to prefunding balance} = \$40,824 \times 1.06 = \$43,273$$

Any unused prefunding balance is adjusted to the first day of the next year using the actual rate of return for the current year (10% rate of return for 2014).

$$\text{Prefunding balance}_{1/1/2015} = (\$25,000 \times 1.1) + \$43,273 = \$70,773$$

Answer is D.

Question 12

The normal cost under the projected unit credit cost method is equal to the present value of the increase in the accrued benefit for the current year, assuming salary is projected using the salary scale to assumed retirement age. Smith is age 42 as of the valuation date, and the assumed retirement age is 65 (general conditions of the exam).

$$\text{Final compensation (3.0\% salary scale)} = \$78,000 \times 1.03^{23} = \$153,940$$

$$\text{Final compensation (3.5\% salary scale)} = \$78,000 \times 1.035^{23} = \$172,077$$

Normal cost (7.5% interest and 3.5% salary scale)

$$= 2\% \times \$172,077 \times \ddot{a}_{65@7.5\%}^{(12)} \times v_{7.5\%}^{23} = \$3,441.54 \times 9.72 \times 0.189498 = \$6,339$$

Normal cost (7% interest and 3.5% salary scale)

$$= 2\% \times \$172,077 \times \ddot{a}_{65@7\%}^{(12)} \times v_{7\%}^{23} = \$3,441.54 \times 10.11 \times 0.210947 = \$7,340$$

Normal cost (7.5% interest and 3.0% salary scale)

$$= 2\% \times \$153,940 \times \ddot{a}_{65@7.5\%}^{(12)} \times v_{7.5\%}^{23} = \$3,078.80 \times 9.72 \times 0.189498 = \$5,671$$

$$\$X = \$7,340 - \$6,339 = \$1,001 \text{ increase}$$

$$\$Y = \$6,339 - \$5,671 = \$668 \text{ decrease}$$

$$|\$X| + |\$Y| = \$1,001 + \$668 = \$1,669$$

Answer is D.

Question 13

The target normal cost is equal to the present value of the increase in the accrued benefit for the year. For this purpose, the beginning of year accrued benefit uses salary history through the end of the prior year, and the end of year accrued benefit uses salary history through the end of the prior year as well as current year expected salary (equal to the prior year salary increased by the assumed salary scale).

Smith has 3 years of service as of 1/1/2015 and 4 years of service as of 12/31/2015.

$$\text{High 3-year average compensation}_{1/1/2015} = \frac{\$100,000 + \$150,000 + \$200,000}{3} = \$150,000$$

$$\begin{aligned} \text{High 3-year average compensation}_{12/31/2015} \\ = \frac{\$150,000 + \$200,000 + (\$200,000 \times 1.1)}{3} = \$190,000 \end{aligned}$$

$$\text{Accrued benefit as of 1/1/2015} = 8\% \times \$150,000 \times 3 \text{ years of service} = \$36,000$$

$$\text{Accrued benefit as of 12/31/2015} = 8\% \times \$190,000 \times 4 \text{ years of service} = \$60,800$$

$$\text{Benefit for purposes of the 2015 target normal cost} = \$60,800 - \$36,000 = \$24,800$$

Note that the compensation limitations of IRC section 401(a)(17) and the benefit limitations of IRC section 415 should be considered, as was the case in question 8. However, the compensation and benefits are small enough in this question that they would not be restricted by either IRC section.

It is assumed based upon the general conditions of the exam that normal retirement age is 65. Smith is currently age 63 on 1/1/2015. The segment 1 interest rate of 5% (applicable to payments made during the first 5 years from the valuation date) is applicable for Smith's annual payments from age 65 and prior to age 68 (the payment at age 68 is discounted using the segment 2 rate because it is made at the beginning of the 6th year from the valuation date). The segment 2 interest rate of 6% (applicable to payments that begin at least 5 years and no more than 20 years from the valuation date) is applicable for Smith's payments beginning at age 68 and prior to age 83. The segment 3 interest rate of 7% (applicable to payments that begin at least 20 years from the valuation date) is applicable for Smith's benefit payments beginning at age 83.

Note that since there are no assumed preretirement decrements (this is an exam general condition, and no preretirement decrement is mentioned in this question), there is an interest only discount from age 65 to age 63 in the determination of the target normal cost.

The commutation functions used are found in the tables of supplementary factors provided with the examination, for a male participant using 5%, 6%, and 7% interest.

Target normal cost

$$\begin{aligned}
 &= \$24,800 \times \left[\frac{N_{65@5\%}^{(12)} - N_{68@5\%}^{(12)}}{D_{65@5\%}} v_{5\%}^2 + \frac{N_{68@6\%}^{(12)} - N_{83@6\%}^{(12)}}{D_{65@6\%}} v_{6\%}^2 + \frac{N_{83@7\%}^{(12)}}{D_{65@7\%}} v_{7\%}^2 \right] \\
 &= \$24,800 \times \left[\frac{459,331 - 352,260}{38,844} v_{5\%}^2 + \frac{171,752 - 22,728}{20,977} v_{6\%}^2 + \frac{10,037}{11,394} v_{7\%}^2 \right] \\
 &= \$237,888
 \end{aligned}$$

Answer is B.

Question 14

The accrued liability under the unit credit cost method is equal to the present value of the accrued benefit. In this question, the plan offers both a retirement benefit and a disability benefit, so the accrued liability is equal to the sum of the liabilities for each benefit.

The probability of disability at age 63 is equal to 0.065, making the probability of not becoming disabled equal to 0.935 ($1.0 - 0.065$). The probability of disability at age 64 is equal to 0.075, making the probability of not becoming disabled equal to 0.925 ($1.0 - 0.075$).

Smith is age 63 as of the valuation date of 1/1/2015. The accrued liability with regard to retirement benefits uses the annuity with regard to healthy mortality, and the accrued liability with regard to disability benefits uses the annuity with regard to disabled mortality.

$$\begin{aligned}AL_{\text{retirement}} &= \$4,500 \times 12 \times \ddot{a}_{65}^{(12)} \times v^2 \times (0.935 \times 0.925) \\ &= \$4,500 \times 12 \times 10.11 \times 0.873439 \times (0.935 \times 0.925) \\ &= \$412,411\end{aligned}$$

$$\begin{aligned}AL_{\text{disability}} &= [\$4,500 \times 12 \times \ddot{a}_{63}^{(12)} \times 0.065 \times (1 - (0.05)(2 \text{ years}))] \\ &\quad + [\$4,500 \times 12 \times \ddot{a}_{64}^{(12)} \times v \times 0.935 \times 0.075 \times (1 - (0.05)(1 \text{ year}))] \\ &= [\$4,500 \times 12 \times 9.00 \times 0.065 \times 0.9] \\ &\quad + [\$4,500 \times 12 \times 8.65 \times 0.934579 \times 0.935 \times 0.075 \times 0.95] \\ &= \$28,431 + \$29,082 = \$57,513\end{aligned}$$

$$\text{Total AL} = \$412,411 + \$57,513 = \$469,924$$

Answer is B.

Question 15

Treasury regulation 1.430(f)-1(f) provides rules relating to elections to use the funding balances to offset the minimum required contribution.

- I. An election to use a funding standard carryover balance to reduce the minimum required contribution that is not timely revoked remains in force, and has the effect of reducing the funding standard carryover balance by the amount elected. This has the same impact on the carryover balance as would an election to reduce the balance (that is, it has been permanently reduced by \$200,000. The statement is true.
- II. Any election to use a funding standard carryover balance to reduce the minimum required contribution must be made by the plan sponsor, who must provide written notification to the plan's enrolled actuary and plan administrator (regulation 1.430(f)-1(f)(1)(i)). The statement is true.
- III. The revocation of an election to use a funding standard carryover balance to reduce the minimum required contribution must be made by the last day of the plan year (12/31/2015). See regulation 1.430(f)-1(f)(3)(iii). Note that there is an exception if the valuation date is not the first day of the plan year, but the general conditions of the exam state that the plan has a first day valuation date. The statement is false.

Answer is A.

Question 16

IRC section 430(g)(4)(A) requires that prior year contributions be included in the actuarial value of assets used in the current year valuation, with an interest adjustment from the date they are contributed to the current year valuation date, using the prior year plan effective rate. There are two receivable contributions for the 2014 plan year. The value of those contributions as of 1/1/2015 is:

$$(\$100,000 \times v_{6.5\%}^{5.5/12}) + (\$300,000 \times v_{6.5\%}^{7.5/12}) = \$97,155 + \$288,422 = \$385,577$$

$$\$X = \$2,500,000 + \$385,577 = \$2,885,577$$

Answer is D.

Question 17

Treasury regulation 1.430(d)-1 (and specifically example 13 of regulation 1.430(d)-1(f)(9)) states that the funding target for a hybrid plan with assumed lump sum payouts is equal to the hypothetical balance (account balance) as of the beginning of the year, accumulated to retirement age using the interest crediting rate, and then discounted back to attained age as of the valuation date using the segment interest rates. Smith is age 62 on the valuation date, 3 years before the assumed age 65 retirement age (assumed based on the exam general conditions). Since a lump sum is assumed to be paid at that time, there will be only one payment, and the segment 1 interest rate of 4% is used to discount that lump sum (the segment 1 rate is used to discount payments within 5 years from the valuation date as required by IRC section 430(h)(2)(C)(ii)).

$$\text{Funding target} = 500,000 \times 1.055^3 \div 1.04^3 = 521,948$$

Answer is C.

Question 18

The plan is at-risk in 2015. In addition, a load applies to the funding target because the plan was at-risk in at least two of the past four years (IRC sections 430(i)(1)(A)(ii) and 430(i)(2)(B)). The load for the funding target is equal to 4% of the calculated funding target without the additional at-risk assumptions, plus \$700 per plan participant.

In addition, there is a phase-in on the funding target because the plan has not been at-risk for at least 5 consecutive years (IRC section 430(i)(5)). The phase-in is done after the load has been added to the at-risk funding target. The phased-in funding target for 2015 is equal to 60% of the not at-risk funding target plus 40% of the at-risk funding target. Note that the plan has been at-risk for 2 consecutive years, so this is the second year of the phase-in. Although the plan was at-risk in 2012 as well, it was not at-risk in 2013, and the phase-in restarts once the plan begins a new period of being at-risk, which was in 2014.

$$\begin{aligned} \text{At-risk funding target with load} \\ = \$17,700,000 + (\$15,300,000 \times .04) + (1,130 \times \$700) = \$19,103,000 \end{aligned}$$

$$\begin{aligned} \text{Funding target with phase-in} \\ = (\$19,103,000 \times 40\%) + (\$15,300,000 \times 60\%) = \$16,821,200 \end{aligned}$$

The funding shortfall for 2015 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). There is a \$400,000 prefunding balance in this question.

The funding shortfall as of 1/1/2015 is:

$$\$16,821,200 - (\$16,500,000 - \$400,000) = \$721,200$$

The new 2015 shortfall base is equal to the funding shortfall, less the outstanding balance of the prior shortfall amortization bases.

$$\text{2015 shortfall amortization base} = \$721,200 - \$1,168,738 = (\$447,538)$$

$$\text{2015 shortfall installment for new base} = (\$447,538)/5.9982 = (\$74,612)$$

Note that the 7-year amortization factor of 5.9982 was provided in a table with the exam as the factor when the segment rates are (5%, 6%, 7%).

Answer is C.

Question 19

Treasury regulation 1.430(h)(3)-1(b)(2) provides that combined mortality tables for annuitants and non-annuitants can only be used in plans with 500 or fewer participants. The statement is true.

Answer is A.

Question 20

The accrued liability under the projected unit credit cost method is equal to the present value of the beginning of year accrued benefit, assuming salary is projected using the salary scale to assumed retirement age.

Smith is age 67 with 15 years of service as of the valuation date, and the assumed retirement age is 65 (general conditions of the exam). So it must be assumed that Smith retires on the 1/1/2015 valuation date, and there is no projection of Smith's salary since Smith is assumed to have no future service. Generally, the postponed retirement benefit is equal to the greater of the normal retirement benefit increased actuarially to the late retirement age, or the plan accrued benefit granting additional service and using salary history after normal retirement age. However, in this question there is no actuarial increase granted, which is allowed when suspension of benefit notices are provided.

$$\begin{aligned}\text{Smith AL} &= 1.25\% \times \frac{\$40,000 + \$49,000 + \$52,000}{3} \times 15 \text{ yrs of service} \times \ddot{a}_{67}^{(12)} \\ &= 1.25\% \times \$47,000 \times 15 \times 11.18 = \$98,524\end{aligned}$$

Jones is age 55 with 7 years of service as of the valuation date, and salary increases must be assumed through age 65.

$$\begin{aligned}\text{Jones AL} &= 1.25\% \times \$68,000 \times \frac{1.025^8 + 1.025^9 + 1.025^{10}}{3} \times 7 \text{ yrs of service} \times \ddot{a}_{65}^{(12)} \times v^{10} \\ &= 1.25\% \times \$68,000 \times 1.249117 \times 7 \times 11.83 \times 0.613913 = \$53,977\end{aligned}$$

$$\text{\$X} = \$98,524 + \$53,977 = \$152,501$$

Answer is B.

Question 21

The four quarterly due dates for the 2015 plan year are 4/15/2015, 7/15/2015, 10/15/2015, and 1/15/2016. The contribution for 2015 of \$300,000 was paid on 7/15/2015, so the quarterly contribution of \$150,000 that was due on 4/15/2015 was late by 3 months. The remaining quarterly contributions are made timely.

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 1/1/2015 using the plan effective rate of 5%. This must be done only for the 4/15/2015 quarterly contribution which was paid 3 months late, on 7/15/2015. The remaining contributions are discounted only using the 5% plan effective rate.

The present value of the contributions as of 1/1/2015 is:

$$150,000 v_{10\%}^{\frac{3}{12}} v_{5\%}^{\frac{3.5}{12}} + 150,000 v_{5\%}^{\frac{6.5}{12}} + 150,000 v_{5\%}^{\frac{9.5}{12}} + 150,000 v_{5\%}^{\frac{12.5}{12}} \\ = 144,399 + 146,088 + 144,317 + 142,567 = 577,371$$

$$\text{Remaining minimum required contribution to be funded} = 820,000 - 577,371 = 242,629$$

The final contribution is made on 9/15/2016, 20½ months after the valuation date. The remaining minimum required contribution must be increased with interest at the plan effective rate to that date.

$$X = 242,629 \times 1.05^{\frac{20.5}{12}} = 263,719$$

Note that the minimum required contribution is also the smallest amount needed to satisfy the minimum funding standard because there are no funding balances to offset the minimum required contribution.

Answer is D.

Question 22

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 year valuation date.

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 administrative 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 2014 of 6.5% is used to determine the expected earnings for that year (the segment 3 interest rate of 7.5% is larger).

The expected earnings for 2014 are:

$$[(250,000 + 20,000) \times .065] - [(20,000 + 4,000) \times .065/2] = 16,770$$

Note that the benefit payments and administrative expenses occurred on 7/1, so there is 1/2 of a year of expected earnings associated with those transactions. There is also a 2014 contribution of \$20,000 deposited on 1/2/2014, which gets a full year of assumed interest (the one day difference is of no material impact).

There is also a receivable contribution of \$10,000 made on 9/1/2015. There are no expected earnings with regard to this contribution, but it must be included in the actuarial value of assets for the 1/1/2015 valuation since it is a receivable for 2014. It must be discounted with interest at the 2014 plan effective rate of 6.25% for 8 months, from the date contributed to 1/1/2015.

$$1/1/2015 \text{ present value of 2014 receivable contribution} = 10,000 \times v_{6.25\%}^{8/12} = 9,604$$

$$\begin{aligned} 1/1/2014 \text{ adjusted fair market value (adjusted to 1/1/2015)} \\ = 250,000 + 20,000 + 9,604 - 20,000 - 4,000 + 16,770 = 272,374 \end{aligned}$$

$$\begin{aligned} 1/1/2015 \text{ fair market value (including 2014 receivable contribution)} \\ = 328,000 + 9,604 = 337,604 \end{aligned}$$

$$1/1/2015 \text{ actuarial value} = (272,374 + 337,604)/2 = 304,989$$

Under IRC section 430(g)(3)(B)(iii), the actuarial value cannot be less than 90% of the market value of the assets (including receivable contributions). 90% of \$337,604 is equal to \$303,844.

The 1/1/2015 actuarial value of assets is equal to \$304,989.

Answer is C.

Question 23

IRC section 430(b) states that the target normal cost is equal to the present value of all benefits that are expected to accrue or be earned during the year, plus the amount of plan expenses expected to be paid out of the plan trust, less the amount of mandatory contributions expected to be paid into the plan. If the amount of mandatory contributions exceeds the expected amount of plan expenses, then the target normal cost can be less than the present value of all benefits that are expected to accrue or be earned during the year. The statement is false.

Answer is B.

Question 24

The funding standard carryover balance must be reduced to zero before an election can be made to use the prefunding balance to reduce the minimum required contribution (IRC section 430(f)(3)(B)). The statement is true.

Answer is A.

Question 25

There is no plan size requirement under Treasury regulations 1.430(h)(3)-1(d) and (e) in order to use either the static or generational mortality table. The statement is true.

Answer is A.

Question 26

Revenue Notice 2011-3 provides rules relating to the alternative amortization schedules for shortfall amortization bases under the Pension Relief Act of 2010. In the notice, Q&A G-4 describes the calculation of the amortization installments under the 15-year schedule, which has been elected for the 2011 shortfall amortization base. The base is amortized for the first 5 years using the segment 1 interest rate for 2011 and for the remaining 10 years using the segment 2 interest rate for 2011.

15-year amortization of 2011 shortfall amortization base

$$= \frac{55,000}{\ddot{a}_{\overline{5}|5\%} + (\ddot{a}_{\overline{10}|6\%} \times v_{6\%}^5)} = \frac{55,000}{4.545951 + (7.801692 \times 0.747258)} = 5,301$$

An installment acceleration amount is defined under IRC section 430(c)(7)(C) as extraordinary dividend and redemption payments. For plans using a 15-year amortization schedule with regard to a shortfall amortization base, any installment acceleration amount during the first 5 years of amortization must be used to increase the amortization installment of the shortfall base for that year (Revenue Notice 2011-3, Q&A I-2(a)). However, in no event is the shortfall installment increased to an amount that would exceed the excess of the cumulative (without interest) payments under the 7-year amortization schedule over the cumulative (without interest and not including any current year installment acceleration amount) payments under the 15-year amortization schedule. See Revenue Notice 2011-3, Q&A I-4.

7-year amortization of 2011 shortfall amortization base = $55,000/5.9982 = 9,169$

Note that the 7-year amortization factor of 5.9982 for segment rates (5%, 6%, 7%) was provided in an attachment to the exam rather than in the body of the question.

2014 was the 4th year that the 2011 shortfall base was being amortized.

Cumulative payments using 7-year schedule = $9,169 \times 4 = 36,676$

Cumulative payments using 15-year schedule = $5,301 \times 4 = 21,204$

Maximum 2014 installment acceleration amount = $36,676 - 21,204 = 15,472$

The 2014 installment acceleration amount of 17,500 must be limited to 15,472. The excess installment acceleration amount is carried over to the following year (2015) and used to increase the 2015 shortfall amortization installment with regard to the 2015 base. Note that had 2015 been more than 5 years after the base was established, then the excess installment acceleration amount would never be used. See Revenue Notice 2011-3, Q&A I-5.

Excess installment acceleration amount = $17,500 - 15,472 = 2,028$

X = 2015 shortfall installment = $5,301 + 2,028 = 7,329$

Answer is C.

Question 27

IRC section 431(d)(1)(B) provides requirements that must be satisfied in order for a multiemployer plan to be automatically approved to extend the amortization period of bases.

These requirements include:

1. Without the extension, the plan would have a funding deficiency in the current year or any of the 9 succeeding plan years. In this question, the plan would have a funding deficiency as of 9/30/2022, which is the plan year beginning 10/1/2021. That would be 7 years from the current year beginning 10/1/2014, so this requirement is satisfied.
2. The plan sponsor has adopted a plan to improve the plan's funded status. That requirement is satisfied.
3. The plan is projected to have sufficient assets to pay benefits and expenditures over the extended period of amortization. That requirement is satisfied since this plan is expected to be able to pay benefits for the next 30 years.
4. A notice of filing for the extension is provided to affected participants prior to filing for the extension. This requirement is satisfied because the notice was provided the day before the filing date.

The statement is true.

Answer is A.

Question 28

When a plan participant retires, the gain or loss is equal to the difference between the actual liability and the expected liability (if they had not retired and the accrued liability was determined under the cost method).

Smith has retired at age 63 with 21 years of service. The annual accrued benefit, payable at age 65 is:

$$\$60 \times 12 \times 21 \text{ years of service} = \$15,120$$

This benefit is reduced by 3% for each of the two years that Smith has retired prior to attaining age 65 (for a total reduction of 6%).

$$\text{Early retirement benefit} = \$15,120 \times 0.94 = \$14,213$$

The actual liability is equal to the present value of the early retirement benefit payable immediately at age 63. The commutation functions used are found in the tables of supplementary factors provided with the examination, for a male participant using 6% interest.

$$\text{Actual liability} = \$14,213 \times \ddot{a}_{63}^{(12)} = \$14,213 \times \frac{N_{63}^{(12)}}{D_{63}} = \$14,213 \times \frac{273,822}{23,948} = \$162,512$$

Under the unit credit cost method, the accrued liability is equal to the present value of the beginning of year accrued benefit. For funding purposes, retirement age is assumed to be 65 (general condition of the exam), and there are no assumed pre-retirement decrements (also a general condition of the exam).

$$\begin{aligned} \text{Expected liability} &= \$15,120 \times \ddot{a}_{65}^{(12)} \times v^2 = \$15,120 \times \frac{N_{65}^{(12)}}{D_{65}} \times 0.889996 \\ &= \$15,120 \times \frac{228,812}{20,977} \times 0.889996 = \$146,783 \end{aligned}$$

There is an experience loss, because the actual liability is greater than the expected liability.

$$X = \$162,512 - \$146,783 = \$15,729$$

Answer is C.

Question 29

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 3-year smoothing period.

The adjustment to the current market value of assets is equal to $\frac{2}{3}$ of the prior year gain/loss and $\frac{1}{3}$ of the second prior year gain/loss.

The asset gain for 2013 is given, but the asset gain for 2014 must be determined.

The actual asset gain or loss for 2014 is equal to the 1/1/2015 market value of assets, reduced by the 1/1/2014 market value of assets (adjusted for contributions and benefit payments and expense payments made during 2014).

$$\text{Actual 2014 asset loss} = 40,000 - (50,000 - 1,500 + 5,000) = 13,500$$

The expected asset gain for 2014 is the expected return (using the assumed interest rate of 7%) on the 1/1/2014 market value of assets, the contribution made on 11/1/2014 (with pro-rated interest for 2 months) and the benefit payments made on 7/1/2014 (with pro-rated interest for 6 months). Either simple interest or compound interest can be used for this purpose (the Revenue Procedure does not require one or the other, just consistency).

$$\begin{aligned} \text{Expected 2014 asset gain} &= (50,000 \times 0.07) + (5,000 \times \frac{2}{12} \times 0.07) \\ &\quad - (1,500 \times \frac{6}{12} \times 0.07) = 3,506 \end{aligned}$$

The 2014 asset loss is equal to the sum of the actual loss and the expected gain.

$$2014 \text{ asset loss} = 13,500 + 3,506 = 17,006$$

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.

$$\begin{aligned} \text{AVA}_{1/1/2015} &= 40,000 + (\frac{2}{3} \times 17,006) - (\frac{1}{3} \times 3,000) \\ &= 50,337, \text{ but not to exceed } 48,000 (40,000 \times 120\%) \end{aligned}$$

The actuarial value of assets as of 1/1/2015 is \$48,000.

Answer is D.

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).

The funding target and target normal cost are not provided and must be calculated.

The target normal cost is equal to the present value of the increase in the accrued benefit for the year. For this purpose, the beginning of year accrued benefit uses salary history through the end of the prior year, and the end of year accrued benefit uses salary history through the end of the prior year as well as current year expected salary (equal to the prior year salary increased by the assumed salary scale, which is 0% in this question).

The funding target is equal to the present value of the accrued benefit in effect at the beginning of the year (using salary history through the end of the prior year).

Smith is age 45 and has 3 years of service as of 1/1/2015. The normal retirement benefit is based upon the final 3-year average salary. It is assumed based upon the general conditions of the exam that normal retirement age is 65 and that there are no preretirement decrements.

Smith's final 3-year average salary is:

$$\text{As of 1/1/2015: } \frac{100,000 + 150,000 + 175,000}{3} = 141,667$$

$$\text{As of 12/31/2015: } \frac{150,000 + 175,000 + 175,000}{3} = 166,667$$

$$\text{Accrued benefit as of 1/1/2015} = 10\% \times 141,667 \times 3 \text{ years of service} = 42,500$$

$$\text{Accrued benefit as of 12/31/2015} = 10\% \times 166,667 \times 4 \text{ years of service} = 66,667$$

Smith is 20 years from the assumed retirement age of 65, so only the segment 3 interest rate (5.5%) is used to determine the funding target and target normal cost. Note that for deduction purposes, the segment rates without adjustment for MAP-21 are used (see Revenue Notice 2012-61, Q&A NA-1).

$$\text{Funding target} = 42,500 \times \ddot{a}_{65}^{(12)} \times v_{5.5\%}^{20} = 42,500 \times 11.35 \times 0.342729 = 165,324$$

$$\begin{aligned} \text{Target normal cost} &= (66,667 - 42,500) \times \ddot{a}_{65}^{(12)} \times v_{5.5\%}^{20} = 24,167 \times 11.35 \times 0.342729 \\ &= 94,009 \end{aligned}$$

There are no assumed future compensation increases; however, future compensation is assumed to be \$175,000 per year, so the final 3-year average compensation for Smith at retirement would be \$175,000. This must be used to determine a funding target taking into account the assumed future compensation increases.

$$\begin{aligned} \text{Funding target with assumed future compensation increases} \\ &= 10\% \times 175,000 \times 3 \text{ years of service} \times \ddot{a}_{65}^{(12)} \times v_{5.5\%}^{20} \\ &= 52,500 \times 11.35 \times 0.342729 = 204,224 \end{aligned}$$

$$\text{Cushion amount} = (50\% \times 165,324) + (204,224 - 165,324) = 121,562$$

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

$$94,009 + 165,324 + 121,562 - 200,000 = 180,895$$

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. At-risk plans must use additional actuarial assumptions with regard to assumed early retirement age and assumed form of benefit elected. This question has no early retirement age and no optional form of benefit, so the additional at-risk assumptions have no impact. The deduction limit under IRC section 404(o)(2)(B) can be ignored, and the deductible limit is \$180,895.

Answer is E.

Question 31

IRC section 430(e) provides rules for amortizing waived funding deficiencies.

- I. IRC section 430(e)(2)(A) states that the amortization installments are for 5 years beginning with the succeeding plan year. So, the 2014 waived deficiency would begin to be amortized in the 2015 plan year. The statement is true.
- II. IRC section 430(e)(3) states that the segment rates, not the plan effective rate, for the year the deficiency was waived are used to amortize the waived deficiency. The 2014 segment rates should be used for this purpose. The statement is false.
- III. IRC section 430(e)(5) provides that if the funding shortfall in any year after the waiver year is zero, then the waived deficiency is considered to be fully amortized. The statement is true.

Answer is B.

Question 32

Revenue Ruling 77-2 requires that a plan amendment adopted on or before the valuation date must be taken into account in the determination of the minimum required contribution. The amendment was adopted on 11/15/2014, and must be taken into account on the 1/1/2015 valuation. It must be used to determine the 1/1/2015 target normal cost. The statement is true.

Answer is D.

Question 33

IRC section 430(j)(3)(A) requires that if there was a funding shortfall for the preceding year, quarterly contributions are required to be made for a plan year. There was a funding shortfall in 2014, so quarterly contributions are required to be made for the 2015 plan year. 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.

$$90\% \text{ of 2015 minimum required contribution} = 90\% \times \$600,000 = \$540,000$$

The quarterly contribution due on 4/15/2015 is equal to 25% of the 2014 minimum required contribution:

$$25\% \times \$500,000 = \$125,000$$

\$50,000 has already been contributed for 2015 on 2/15/2015, so there is still \$75,000 due that must be deposited on 4/15/2015. Note that the \$50,000 contribution made prior to the quarterly due date is not increased with interest.

$$\text{\$X} = \$75,000$$

Answer is D.

Question 34

A waiver of the minimum funding requirement can be granted for a single employer plan provided there have been no more than 3 waivers in the past 15 years (IRC section 412(c)(1)(A)). In this question, there are waived deficiencies in 2013 and 2014, but not prior to those years, so with the 2015 waived deficiency, there will be 3 waivers in the past 15 years. In addition, IRC section 412(c)(1)(C) provides that the amortization of prior waived deficiencies cannot be waived. So, the amortization of the 2013 and 2014 waived deficiencies cannot be waived in 2015.

The minimum required contribution for 2015 that can be considered for the 2015 waiver is equal to the target normal cost plus the amortization of the prior year shortfall bases plus the amortization of the 2015 funding shortfall base, if any (there were no shortfall amortization bases prior to 2015).

The funding waiver for 2013 is equal to \$200,000. This waived deficiency is amortized under IRC section 430(e) over a period of 5 years, beginning with 2014. The amortization is based upon the 2013 segment rates (the year in which the deficiency was waived). The segment 1 rate applies to the first 4 payments (from 1/1/2014 through 1/1/2017) and the segment 2 rate applies to the final payment on 1/1/2018. The installment with regard to the 2013 waived deficiency is given as \$44,000.

Similarly, the 2014 waived deficiency of \$100,000, with given installment of \$22,658, is being amortized over a period of 5 years beginning on 1/1/2015 (using the 2014 segment rates).

The outstanding balance of the 2013 and 2014 waived deficiencies as of 1/1/2015 is determined using the 2015 segment rates (only the segment 1 rate is needed since all payments will be made within the next 5 years). There are 4 installments remaining on the 2013 waived deficiency, and all 5 installments are still due with regard to the 2014 waived deficiency.

Outstanding balance of waived deficiencies as of 1/1/2015

$$\begin{aligned} &= (\$44,000 \times \ddot{a}_{\overline{4}|3\%}) + (\$22,658 \times \ddot{a}_{\overline{5}|3\%}) \\ &= (\$44,000 \times 3.828611) + (\$22,658 \times 4.717098) = \$275,339 \end{aligned}$$

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

$$\text{Funding shortfall}_{1/1/2015} = \$1,900,000 - \$1,500,000 = \$400,000$$

There is an exemption from creating a new shortfall amortization base under IRC section 430(c)(5) in cases where the actuarial value of assets (reduced by the total pre-funding balance if the employer elects to use any part of it to reduce the minimum contribution requirement, but not reduced by the funding standard carryover balance) is at least as large as the funding target. The plan is not exempt from creating a new shortfall base because the assets are less than the funding target. The 2015 shortfall base is equal to the funding shortfall less the outstanding balance of prior waiver bases, and the base is amortized over 7 years.

$$\text{2015 shortfall amortization base} = \$400,000 - \$275,339 = \$124,661$$

$$\text{Amortization of 2015 shortfall base} = \$124,661 \div 6.3293 = \$19,696$$

Note that the amortization factor of 6.3293 for amortizing the 2015 shortfall base using the 2015 segment rates is provided in a table of factors provided with the exam. It can also be determined directly, using the segment 1 rate for the first 5 amortization payments and the segment 2 rate for the last 2 payments:

$$\ddot{a}_{\overline{5}|3\%} + v_{4\%}^5 \ddot{a}_{\overline{2}|4\%} = 6.3293$$

2015 minimum required contribution (excluding amortization of waived deficiencies)

$$= \$100,000 + \$19,696 = \$119,696$$

That is the maximum funding waiver for 2015 as permitted under IRC section 412(c).

Answer is A.

Question 35

Page 22 in the SOA study note “Assessment and Selection of Actuarial Assumptions” discusses the selection of assumptions with regard to disability benefits. The plan definition of a disability should be taken into account when selecting such an assumption. The statement is true.

Answer is A.

Question 36

IRC section 4971(e)(2)(A) states that in the case of a plan that is not a multiemployer plan, the other members of a controlled group can be liable for the excise tax upon failure to pay the minimum required contribution to a plan. The statement is false.

Answer is B.

Question 37

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 the maximum 5-year period.

The asset gain for 2011, 2012, and 2013 is given, but the asset gain for 2014 must be determined.

The actual asset gain or loss for 2014 is equal to the 1/1/2015 market value of assets, reduced by the 1/1/2014 market value of assets (adjusted for contributions and benefit payments and expense payments made during 2014).

$$\text{Actual 2014 asset gain} = 635,000 - (620,000 + 55,000 - 80,000) = 40,000$$

The expected asset gain for 2014 is the expected return (using the assumed interest rate of 6%) on the 1/1/2014 market value of assets, the contribution made on 8/1/2014 (with pro-rated interest for 5 months) and the benefit and expense payments made uniformly throughout the year (with pro-rated interest for 6 months, since uniformity is the same as the payments all being made mid-year). Either simple interest or compound interest can be used for this purpose (the Revenue Procedure does not require one or the other, just consistency).

$$\begin{aligned} \text{Expected 2014 asset gain} &= (620,000 \times 0.06) + (55,000 \times \frac{5}{12} \times 0.06) \\ &\quad - (80,000 \times \frac{6}{12} \times 0.06) = 36,175 \end{aligned}$$

The 2014 asset gain is equal to the difference between the actual gain and the expected gain.

$$\text{2014 asset gain} = 40,000 - 36,175 = 3,825$$

The adjustment to the current (1/1/2015) market value of assets is equal to $\frac{4}{5}$ of the prior year gain/loss, $\frac{3}{5}$ of the second prior year gain/loss, $\frac{2}{5}$ of the third prior year gain/loss, and $\frac{1}{5}$ of the fourth prior year gain/loss.

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.

$$\begin{aligned}AVA_{1/1/2015} &= 635,000 - \left(\frac{4}{5} \times 3,825\right) + \left(\frac{3}{5} \times 59,000\right) + \left(\frac{2}{5} \times 33,000\right) + \left(\frac{1}{5} \times 19,000\right) \\ &= 684,340, \text{ but not to exceed } 762,000 (635,000 \times 120\%) \end{aligned}$$

Answer is D.

Question 38

A rehabilitation plan must be adopted for a multiemployer plan in critical status (IRC section 432(e)) and a funding improvement plan must be adopted for a multiemployer plan in endangered status (IRC section 432(c)).

In this question, the plan is in endangered status, and must adopt a funding improvement plan. The statement is false.

Answer is B.

Question 39

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:

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

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).

When the benefit formula is not compensation related, the temporary annuity is equal to the average of the temporary annuity factors for the active participants (Smith and Jones in this question). However, the present value of future benefits includes the present value for each of the participants, active and retired.

It can be assumed based upon the general conditions of the exam that the retirement age is 65 and that there are no preretirement decrements. The present value of future benefits for the three participants is:

$$\begin{aligned} \text{PVFB} &= (2,500 \times 12 \times \ddot{a}_{65}^{(12)} \times v^{15}) + (3,500 \times 12 \times \ddot{a}_{65}^{(12)} \times v^5) + (1,250 \times 12 \times \ddot{a}_{65}^{(12)}) \\ &= (30,000 \times 10.11 \times 0.362446) + (42,000 \times 10.11 \times 0.712986) + (15,000 \times 10.11) \\ &= 109,930 + 302,748 + 151,650 \\ &= 564,328 \end{aligned}$$

$$\text{Temporary annuity} = (\ddot{a}_{15} + \ddot{a}_{5})/2 = (9.745468 + 4.387211)/2 = 7.066340$$

$$\text{FIL normal cost} = \frac{564,328 - 261,000 - 34,000}{7.066340} = 38,114$$

Answer is B.

Question 40

Treasury Regulation 1.430(d)-1(c)(1)(iii)(C) provides that restrictions on benefit payments under IRC section 436 must be taken into account for funding purposes only to the extent that the annuity start date is before the valuation date, but no restriction is to be assumed for payments that begin on or after the valuation date. Although the current AFTAP is 75%, making the plan subject to a partial restriction on payment of the Social Security level income option under IRC section 436(d), the regulation states that valuations can make an assumption of the probability of future elections of the Social Security level income option.

The statement is false.

Answer is B.

Question 41

Treasury Regulation 1.430(f)-1(d)(1)(ii) states that a deemed reduction to a funding balance is assumed to have occurred on the valuation date for the plan year and before any other election to use a funding balance to reduce the minimum required contribution (and pay for a required quarterly contribution). Therefore, the statement in this question is true.

Answer is A.

Question 42

For a single employer plan in which the plan sponsor has not made the minimum required contribution within 8½ months after the close of the plan year, IRC section 4971(a)(1) imposes a 10% excise tax on the unpaid minimum. There is no excise tax on any interest with regard to the unpaid minimum, so the statement is false.

Answer is B.

Question 43

The accrued liability under the entry age normal funding method is equal to the accumulated value of the prior normal costs (as of the 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. The 3% salary scale is incorporated into the determination of the projected benefit. Smith is age 50 as of the valuation date, so the 2014 salary must be projected 15 years to obtain the projected final salary.

$$\begin{aligned}\text{Final salary} &= \$50,000 \times 1.03^{15} = \$77,898 \\ \text{Projected benefit} &= 50\% \times \$77,898 = \$38,949\end{aligned}$$

The present value of benefits 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).

$$\text{PVFB}_{35} = \$38,949 \times \ddot{a}_{65}^{(12)} \times v^{30} = \$38,949 \times 10.11 \times 0.131367 = \$51,729$$

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.

$$\text{Implicit interest rate for amortizing} = (1.07/1.03) - 1 = .038835, \text{ or } 3.8835\%$$

$$\text{NC}_{35} = \text{PVFB}_{35} / \ddot{a}_{30,0.038835} = \$51,729 / 18.220429 = \$2,839$$

The normal cost as of 1/1/2015 (when Smith is age 50) is equal to the normal cost at age 35, increased by 3% per year (since the normal cost increases by the same percentage as does the salary under the exam general conditions).

$$\text{NC}_{50} = \text{NC}_{35} \times 1.03^{15} = \$2,839 \times 1.557967 = \$4,423$$

The accrued liability is equal to the accumulation of the past normal costs through Smith's current age on 1/1/2015 (15 years of accumulation from age 35 to 50). This accumulation also uses the implicit interest rate.

$$\text{AL}_{50} = \text{NC}_{50} \times \ddot{s}_{15,0.038835} = \$4,423 \times 20.622039 = \$91,213$$

Answer is C.

Question 44

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, so the not at-risk numbers should be used.

$$\text{Cushion amount} = (50\% \times 7,000,000) + (10,000,000 - 7,000,000) = 6,500,000$$

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

$$600,000 + 7,000,000 + 6,500,000 - 5,000,000 = 9,100,000$$

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:

$$800,000 + 9,000,000 - 5,000,000 = 4,800,000$$

The deductible limit is the larger of the IRC section 404(o)(2)(A) and 404(o)(2)(B) limits, which is 9,100,000.

Answer is B.

Note: The minimum required contribution is also given in this question as \$900,000. If that had been larger than the otherwise deductible limit under IRC section 404(o), then the minimum required contribution could be deducted.

Question 45

Treasury regulation 1.430(d)-1 (and specifically example 13 of regulation 1.430(d)-1(f)(9)) states that the funding target for a hybrid plan with assumed lump sum payouts is equal to the hypothetical balance (account balance) as of the beginning of the year, accumulated to retirement age using the interest crediting rate, and then discounted back to attained age as of the valuation date using the segment interest rates. In addition, Treasury regulation 1.411(b)(5)-1(d)(2)(i) requires preservation of capital at retirement, meaning that the hypothetical balance at retirement age cannot be less than the sum of the compensation credits allocated to a participant.

Smith is age 60 on the valuation date, 5 years before the assumed age 65 retirement age (assumed based on the exam general conditions). Since a lump sum is assumed to be paid at that time, there will be only one payment, and the segment 2 interest rate of 6% is used to discount that lump sum (the segment 2 rate is used to discount payments made during the 6th through 20th year after the valuation date as required by IRC section 430(h)(2)(C)(ii), and although it is exactly 5 years from the valuation date, the assumed retirement date of 1/1/2020 is actually the first day of the 6th year).

The contribution credits are made on the last day of the year, so the 2012 credit of \$50,000 receives earnings beginning on 1/1/2013, the 2013 credit beginning on 1/1/2014, and the 2014 credit beginning on 1/1/2015.

Cash balance plan account balance as of 1/1/2015 (using actual return on plan assets)

$$= (50,000 \times 0.88) + 50,000 + 50,000 = 144,000$$

Protected principal of cash balance account as of 1/1/2015 = $50,000 \times 3 \text{ years} = 150,000$

Under the interest crediting rate assumption for future projections that was used prior to 1/1/2015, there are no further interest credits through age 65. The projected cash balance account balance as of 1/1/2020 under that assumption is \$150,000 because the principal must be protected, so the 2013 loss is ignored.

Funding target under old assumption = $150,000 \div 1.06^5 = 112,089$

Under the interest crediting rate assumption for future projections that is used beginning 1/1/2015, there is an assumption of 4% annual interest credits through age 65.

Projected account balance as of 1/1/2015 = $144,000 \times 1.04^5 = 175,198$

This exceeds the 150,000 principal that must be preserved, so it is used as the projected account balance.

Funding target under new assumption = $175,198 \div 1.06^5 = 130,918$

$X = 130,918 - 112,089 = 18,829$

Answer is A.

Question 46

Treasury regulation 1.430(d)-1(c)(1)(ii)(B) states that a benefit that is based upon an accrued benefit is determined for purposes of the funding target to be the benefit accrued as of the first day of the plan year. In this question, the death benefit is \$200 multiplied by years of service, so it represents a benefit accrued as of 1/1/2015. That benefit is used to determine the funding target for 2015. The statement is true.

Answer is A.

Question 47

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

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

When the plan benefits are based upon compensation, the temporary annuity is equal to the ratio of the present value of future compensation to current compensation. There is no benefit formula provided in this question, and since the data provided includes the present value of future compensation and total compensation, it can be assumed that the benefit is compensation-based.

$$\text{Normal cost} = \frac{\$3,930,000 - (\$2,530,000 - \$20,000)}{\$4,770,000 / \$540,000} = \$160,755$$

The **smallest amount that satisfies the minimum funding standard** as of 12/31/2015 is equal to the normal cost, reduced by the credit balance, and increased with interest from the valuation date of 1/1/2015 to the last day of the year.

$$\text{\$X} = (\$160,755 - \$20,000) \times 1.07 = \$150,608$$

Answer is C.

Question 48

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

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

When the plan benefits are based upon compensation, the temporary annuity is equal to the ratio of the present value of future compensation to current compensation.

$$1/1/2014 \text{ normal cost} = \frac{\$30,000,000 - \$10,000,000}{\$200,000,000 / \$10,000,000} = \$1,000,000$$

The 1/1/2015 normal cost will be equal to the 1/1/2014 normal cost increased by the salary scale, providing all actuarial assumptions are met.

$$1/1/2015 \text{ normal cost (actuarial assumptions met)} = \$1,000,000 \times 1.06 = \$1,060,000$$

In order to determine the actual normal cost for 2015, experience must be used to adjust the 1/1/2014 valuation results to 1/1/2015. Since there were no new participants and no retirees (all participants were active and under age 50 as of 1/1/2014), the present value of future benefits will increase at the valuation rate of 7% (all participants will be one year closer to retirement age). However, salaries increased by 10% rather than the assumed 6%, so the present value of future benefits will increase by the ratio of the actual increase to the expected increase.

$$PVFB_{1/1/2015} = \$30,000,000 \times 1.07 \times (1.10/1.06) = \$33,311,321$$

The actuarial value of assets increased in value by the assumed interest rate of 7%. In addition, there was a contribution for 2014 of \$1,000,000 (the normal cost) paid on 1/1/2014, which also increased in value by 7%.

$$AVA_{1/1/2015} = (\$10,000,000 + \$1,000,000) \times 1.07 = \$11,770,000$$

The present value of future compensation must be adjusted by a reduction in the 2014 salary (assumed paid on 1/1/2014), interest of 7%, and the ratio of the actual to expected salary increase.

$$PVFS_{1/1/2015} = (\$200,000,000 - \$10,000,000) \times 1.07 \times (1.10/1.06) = \$210,971,698$$

Salary increased by 10%.

$$2015 \text{ Compensation} = \$10,000,000 \times 1.1 = \$11,000,000$$

The 1/1/2015 actual normal cost can now be determined. Note that there is not a credit balance as of 12/31/2014 because the normal cost was contributed on 1/1/2014, and that is the minimum required contribution under the Aggregate cost method.

$$1/1/2015 \text{ normal cost} = \frac{\$33,311,321 - \$11,770,000}{\$210,971,698 / \$11,000,000} = \$1,123,158$$

The **smallest amount that satisfies the minimum funding standard** as of 12/31/2015 is equal to the normal cost, reduced by the credit balance (there is none in this question), and increased with interest from the valuation date of 1/1/2015 to the last day of the year.

$$\$X = \$1,060,000 \times 1.07 = \$1,134,200$$

$$\$Y = \$1,123,158 \times 1.07 = \$1,201,779$$

$$\$Y - \$X = \$1,201,779 - \$1,134,200 = \$67,579$$

Answer is D.

Question 49

A plan is subject to liquidity requirements if it is subject to the quarterly contribution requirement and had more than 100 participants on any day of the prior year (IRC section 430(j)(4)(B)). The liquidity requirement applies to this plan.

The liquidity shortfall under IRC section 430(j)(4)(E)(i) is equal to the base amount (three times the adjusted disbursements) less the value of the plan's liquid assets. The liquidity shortfall is determined as of the end of a plan quarter (3/31/2015 in this question).

The adjusted disbursements is equal to the total disbursements during the 12 month period ending on the date the liquidity shortfall is being determined (from 4/1/2014 through 3/31/2015 in this question) reduced by a "percentage" of the non-recurring disbursements (lump sum payments and purchases of annuities). The "percentage" is equal to the plan's funding target attainment percentage (FTAP) for the current plan year. See IRC section 430(j)(4)(E)(iv).

$$\text{Total disbursements}_{3/31/2015} = 265,000 + 22,000 + 250,000 + 200,000 = 737,000$$

$$\text{Adjusted disbursements}_{3/31/2015} = 737,000 - [90\% \times (250,000 + 200,000)] = 332,000$$

$$\text{Liquidity shortfall}_{3/31/2015} = (3 \times 332,000) - 900,000 = 96,000$$

Answer is C.

Notes: The plan's liquid assets are not adjusted by any contributions made during the year prior to the date that the liquidity shortfall is determined (this should make logical sense because the contribution is available to pay disbursements, so it should be used to offset the adjusted disbursements to help prevent a liquidity shortfall). In addition, the amount of the quarterly contribution does not impact the amount of the liquidity shortfall.

Question 50

The minimum required contribution under the Entry Age Normal method is equal to the normal cost, plus the amortization charges, less the amortization credits, brought forward with interest at the valuation rate to the last day of the plan year. The **smallest amount needed to satisfy the minimum funding standard** is the minimum required contribution, reduced by the credit balance (brought forward with valuation interest to the end of the plan year).

The credit balance is provided as of 12/31/2013, but must be determined as of 12/31/2014. The 12/31/2014 credit balance is the excess of the credits (credit balance, contribution, and amortization credits) over the charges (normal cost and amortization charges) as of 1/1/2014, increased with interest as needed (the 2014 contribution receives no interest because it was contributed on 12/31/2014) to the end of 2014.

$$\begin{aligned} \text{CB}_{12/31/2014} &= [(\$1,000,000 + \$100,000) \times 1.07 + \$300,000] - [(\$350,000 + \$500,000) \times 1.07] \\ &= \$567,500 \end{aligned}$$

The 1/1/2015 normal cost is provided, as are the amortization charges and credits for amortization bases established on or before 1/1/2014. However, the entry age normal method is an immediate gain method, so the experience gain or loss for 2014 must be determined as a new base to be amortized over 15 years beginning on 1/1/2015.

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.

$$\text{Actual UAL}_{1/1/2015} = \$7,000,000 - \$6,280,000 = \$720,000$$

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 2014 contribution since it was contributed on the last day of the year).

$$\begin{aligned} \text{Expected UAL}_{1/1/2015} &= [(\$7,000,000 - \$6,250,000) + \$350,000] \times 1.07 - \$300,000 \\ &= \$877,000 \end{aligned}$$

$$\text{2014 Gain} = \$877,000 - \$720,000 = \$157,000$$

$$\text{Amortization of 2014 gain (credit base)} = \$157,000 / \ddot{a}_{\overline{15}|} = \$16,110$$

$$\begin{aligned} \text{Minimum required contribution}_{1/1/2015} &= \$375,000 + \$475,000 - \$80,000 - \$16,110 \\ &= \$753,890 \end{aligned}$$

$$\text{\$X} = (\$753,890 - \$567,500) \times 1.07 = \$199,437$$

Answer is B.

Question 51

The funding target for a plan participant is equal to the present value as of the valuation date of the benefit accrued as of the first day of the plan year. As of 1/1/2014, Smith is age 44 with 7 years of service. Only the segment 3 interest rate of 7.5% is used to determine the present value, because Smith has more than 20 years before reaching the assumed retirement age of 65 (retirement age 65 is a general condition of the exam).

$$1/1/2014 \text{ accrued benefit} = 10\% \times \$200,000 \times 7 \text{ years of service} = \$140,000$$

The limitation of IRC section 415 must be considered with regard to the accrued benefit. Smith entered the plan on 1/1/2009 and has only five years of plan participation as of 1/1/2014. The IRC section 415 dollar limit for 2014 is \$210,000. This is reduced when years of plan participation are less than 10, as is the case for Smith.

$$1/1/2014 \text{ IRC section 415 dollar limit} = \frac{5}{10} \times \$210,000 = \$105,000$$

The accrued benefit for Smith must be limited to \$105,000.

$$\begin{aligned} \text{Funding target}_{1/1/2014} &= \$105,000 \times \ddot{a}_{65}^{(12)} \times v_{7.5\%}^{21} \\ &= \$105,000 \times 9.79 \times 0.218989 = \$225,110 \end{aligned}$$

Answer is B.

Question 52

The minimum required contribution under the Unit Credit method is equal to the normal cost, plus the amortization charges, less the amortization credits, brought forward with interest at the valuation rate to the last day of the plan year. The **smallest amount needed to satisfy the minimum funding standard** is the minimum required contribution, reduced by the credit balance (brought forward with valuation interest to the end of the plan year).

All amortization bases were combined and offset as of 10/1/2013, so there is only one amortization base at that point in time, with a single amortization charge of \$525,000.

The credit balance is provided as of 9/30/2013, but must be determined as of 9/30/2014. The 9/30/2014 credit balance is the excess of the credits (credit balance, contribution, and amortization credits) over the charges (normal cost and amortization charges) as of 10/1/2013, increased with interest as needed (the contribution for the year ended 9/30/2014 receives no interest because it was contributed on the last day of the year) to 9/30/2014.

$$\begin{aligned} \text{CB}_{9/30/2014} &= [(\$820,000 \times 1.07) + \$565,000] - [(\$450,000 + \$525,000) \times 1.07] \\ &= \$399,150 \end{aligned}$$

The 10/1/2014 normal cost is provided, and the amortization charges for the combined base remains the same as in the 10/1/2013 valuation. However, the unit credit method is an immediate gain method, so the experience gain or loss for the period from 10/1/2013 through 9/30/2014 must be determined as a new base to be amortized over 15 years beginning on 10/1/2014.

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.

$$\text{Actual UAL}_{10/1/2014} = \$6,750,000 - \$4,700,000 = \$2,050,000$$

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 9/30/2014 contribution since it was contributed on the last day of the year).

$$\begin{aligned}\text{Expected UAL}_{10/1/2014} &= [(\$6,070,000 - \$5,750,000) + \$450,000] \times 1.07 - \$565,000 \\ &= \$258,900\end{aligned}$$

$$9/30/2014 \text{ Loss} = \$2,050,000 - \$258,900 = \$1,791,100$$

$$\text{Amortization of 9/30/2014 loss (charge base)} = \$1,791,100 / \ddot{a}_{\overline{15}|} = \$183,788$$

$$\begin{aligned}\text{Minimum required contribution}_{10/1/2014} &= \$450,000 + \$525,000 + \$183,788 \\ &= \$1,158,788\end{aligned}$$

$$\$X = (\$1,158,788 - \$399,150) \times 1.07 = \$812,813$$

Answer is D.

Question 53

In order to determine excess contribution amounts, the contributions made must be interest adjusted using the plan effective rate from the date they are made to the valuation date. The \$200,000 contribution made on 7/1/2014 is adjusted for 6 months.

$$\$200,000/1.06^{6/12} = \$194,257$$

The excess contribution for 2014 is: $\$194,257 - \$150,000 = \$44,257$

The general conditions of the exam state that the employer elects to add excess contributions to the prefunding balance. This is done as of the first day of the following year (1/1/2015), and the excess contribution is increased with interest using the effective interest rate for the current year of 6%.

$$\text{Addition to prefunding balance} = \$44,257 \times 1.06 = \$46,912$$

The \$20,000 that was elected to be used to apply to the minimum required contribution was not needed to avoid a funding deficiency. As a result, it is added to the prefunding balance as of 1/1/2015 (the next plan year beginning date) with interest. However, since it was not used to reduce the minimum required contribution, it is increased with the actual rate of return for 2014 (as it would have been increased that way had it not been elected to be used to apply to the minimum). See Treasury regulation 1.430(f)-1(b)(3)(iii).

$$\text{Excess contribution added to 1/1/2015 prefunding balance} = \$20,000 \times 1.04 = \$20,800$$

$$\text{1/1/2015 prefunding balance} = \$46,912 + \$20,800 = \$67,712$$

Answer is D.

Question 54

The funding target for a retired participant is equal to the present value of the accrued benefit using the funding assumptions as of the valuation date. Smith has retired early at age 64. The accrued benefit for Smith, including the 4% early retirement reduction for retirement prior to age 65 is:

$$\text{Annual accrued benefit at age 64} = \$1,200 \times 10 \text{ years of service} \times 0.96 = \$11,520$$

The normal form of benefit is a single life annuity (exam general conditions). The annual accrued benefit is in that form. Smith has elected to receive the benefit in the form of a ten-year certain only annuity. Actuarial equivalence based upon plan assumptions is used to convert the benefit from a life annuity to a ten-year certain annuity because the exam general conditions state that unless it is otherwise stated, optional forms of benefit are determined at no cost to the employer (thus using plan equivalence).

$$\text{Annual 10-year certain benefit} = \$11,520 \times \frac{\ddot{a}_{64}^{(12)}}{\ddot{a}_{\overline{10}|}^{(12)}} = \$11,520 \times \frac{10.30}{7.30} = \$16,254.25$$

$$\$X = \$11,520 \times \ddot{a}_{64}^{(12)} = \$11,520 \times 11.50 = \$132,480$$

$$\$Y = \$16,254.25 \times \ddot{a}_{\overline{10}|}^{(12)} = \$16,254.25 \times 7.69 = \$124,995$$

$$\$X - \$Y = \$132,480 - \$124,995 = \$7,485$$

Answer is C.

Note: The exam booklet uses the notation $\ddot{a}_{\overline{10}|}^{(12)}$. This is supposed to represent a 10-year certain annuity, for which the correct notation would be $\ddot{a}_{\overline{10}|}^{(12)}$.

Question 55

The funding target for a plan participant is equal to the present value as of the valuation date of the benefit accrued as of the first day of the plan year. As of 1/1/2015, Smith is age 43 with 17 years of service. Only the segment 3 interest rate of 7.5% is used to determine the present value, because Smith has more than 20 years before reaching the assumed retirement age of 65 (retirement age 65 is a general condition of the exam). The accrued benefit as of 1/1/2015 does not include any salary projection beyond 2014.

$$1/1/2015 \text{ accrued benefit} = 1.5\% \times \$75,000 \times 17 \text{ years of service} = \$19,125$$

$$\$X = \$19,125 \times \ddot{a}_{65}^{(12)} \times v_{7.5\%}^{22} = \$19,125 \times 9.79 \times 0.203711 = \$38,142$$

The expected compensation at 1/1/2014 is equal to the 2013 compensation, increased by the assumed salary scale of 3%. The 1/1/2015 accrued benefit using that assumed 2014 compensation is:

$$\text{“Assumed” } 1/1/2015 \text{ AB} = 1.5\% \times \$50,000 \times 1.03 \times 17 \text{ years of service} = \$13,132.50$$

$$\$Y = \$13,132.50 \times \ddot{a}_{65}^{(12)} \times v_{7.5\%}^{22} = \$13,132.50 \times 9.79 \times 0.203711 = \$26,191$$

$$\$X - \$Y = \$38,142 - \$26,191 = \$11,951$$

Answer is B.