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EA-2F Exam 2016

Solutions

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IMPORTANT

THESE FACTORS MAY BE USED FOR ALL QUESTIONS UNLESS OTHER FACTORS ARE PROVIDED, FOR BOTH SINGLE EMPLOYER AND MULTIEMPLOYER PLANS

2016 EA-2 (Segment F) Examination - Selected Commutation Factors
Interest Rates: 3.0%, 4.0%, and 5.0%

MALES	Interest Rate = 3.0%		Interest Rate = 4.0%		Interest Rate = 5.0%		MALES
Age	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	Age
60	162,371	2,658,791	90,937	1,340,228	51,213	684,044	60
61	156,901	2,498,928	87,029	1,251,083	48,545	634,053	61
62	151,492	2,344,506	83,220	1,165,800	45,979	586,684	62
63	146,148	2,195,463	79,513	1,084,278	43,512	541,836	63
64	140,836	2,051,750	75,886	1,006,428	41,132	499,414	64
65	135,583	1,913,322	72,353	932,161	38,844	459,331	65
66	130,379	1,780,124	68,907	861,387	36,641	421,497	66
67	125,183	1,652,127	65,525	794,031	34,511	385,832	67
68	120,037	1,529,303	62,227	730,017	32,462	352,260	68
69	114,973	1,411,587	59,029	669,256	30,500	320,698	69
70	109,959	1,298,912	55,912	611,656	28,614	291,062	70
71	105,032	1,191,212	52,893	557,128	26,812	263,274	71
72	100,146	1,088,419	49,948	505,585	25,078	237,257	72
73	95,292	990,498	47,069	456,957	23,407	212,945	73
74	90,457	897,422	44,251	411,179	21,797	190,276	74
75	85,635	809,175	41,490	368,193	20,242	169,192	75
76	80,779	725,766	38,761	327,954	18,730	149,643	76
77	75,938	647,206	36,087	290,418	17,272	131,581	77
78	71,068	573,500	33,448	255,541	15,857	114,958	78
79	66,174	504,676	30,846	223,285	14,484	99,730	79
80	61,264	440,752	28,282	193,614	13,153	85,856	80
81	56,348	381,741	25,763	166,487	11,868	73,292	81
82	51,418	327,652	23,283	141,860	10,623	61,995	82
83	46,499	278,489	20,853	119,691	9,424	51,922	83
84	41,695	234,192	18,519	99,909	8,289	43,018	84
85	36,971	194,662	16,263	82,424	7,210	35,224	85

FEMALES	Interest Rate = 3.0%		Interest Rate = 4.0%		Interest Rate = 5.0%		FEMALES
Age	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	Age
60	163,946	2,815,736	91,820	1,409,832	51,710	715,452	60
61	158,455	2,654,307	87,891	1,319,814	49,026	664,972	61
62	153,040	2,498,334	84,071	1,233,674	46,449	617,127	62
63	147,696	2,347,743	80,355	1,151,306	43,973	571,812	63
64	142,409	2,202,470	76,734	1,072,610	41,591	528,931	64
65	137,188	2,062,454	73,210	997,492	39,304	488,388	65
66	132,027	1,927,631	69,778	925,855	37,104	450,092	66
67	126,914	1,797,948	66,431	857,611	34,988	413,958	67
68	121,864	1,673,349	63,174	792,673	32,956	379,901	68
69	116,876	1,553,771	60,006	730,951	31,005	347,839	69
70	111,948	1,439,153	56,923	672,358	29,132	317,693	70
71	107,073	1,329,440	53,921	616,811	27,333	289,385	71
72	102,271	1,224,568	51,007	564,226	25,610	262,842	72
73	97,500	1,124,484	48,160	514,523	23,950	237,993	73
74	92,792	1,029,141	45,394	467,631	22,359	214,773	74
75	88,114	938,493	42,691	423,476	20,828	193,115	75
76	83,512	852,489	40,072	381,985	19,364	172,959	76
77	78,949	771,068	37,519	343,083	17,957	154,239	77
78	74,383	694,211	35,009	306,715	16,596	136,906	78
79	69,860	621,902	32,564	272,827	15,290	120,908	79
80	65,379	554,096	30,182	241,355	14,037	106,193	80
81	60,944	490,749	27,864	212,235	12,836	92,706	81
82	56,559	431,815	25,610	185,403	11,685	80,398	82
83	52,225	377,242	23,421	160,797	10,584	69,218	83
84	47,950	326,976	21,297	138,349	9,533	59,115	84
85	43,741	280,955	19,241	117,995	8,530	50,042	85

IMPORTANT

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2016 EA-2 (Segment F) Examination - Selected Commutation Factors
Interest Rates: 5.0%, 6.0%, and 7.0%

MALES	Interest Rate = 5.0%		Interest Rate = 6.0%		Interest Rate = 7.0%		MALES
Age	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	Age
60	51,213	684,044	28,999	353,283	16,509	184,514	60
61	48,545	634,053	27,229	325,094	15,356	168,534	61
62	45,979	586,684	25,547	298,636	14,273	153,674	62
63	43,512	541,836	23,948	273,822	13,254	139,868	63
64	41,132	499,414	22,424	250,573	12,295	127,054	64
65	38,844	459,331	20,977	228,812	11,394	115,172	65
66	36,641	421,497	19,601	208,466	10,547	104,166	66
67	34,511	385,832	18,287	189,467	9,748	93,985	67
68	32,462	352,260	17,039	171,752	8,998	84,580	68
69	30,500	320,698	15,858	155,254	8,296	75,904	69
70	28,614	291,062	14,738	139,909	7,638	67,909	70
71	26,812	263,274	13,679	125,657	7,023	60,553	71
72	25,078	237,257	12,673	112,439	6,446	53,795	72
73	23,407	212,945	11,718	100,203	5,904	47,597	73
74	21,797	190,276	10,808	88,902	5,395	41,927	74
75	20,242	169,192	9,943	78,491	4,917	36,751	75
76	18,730	149,643	9,113	68,928	4,464	32,042	76
77	17,272	131,581	8,325	60,176	4,040	27,772	77
78	15,857	114,958	7,570	52,197	3,639	23,915	78
79	14,484	99,730	6,850	44,957	3,262	20,449	79
80	13,153	85,856	6,162	38,423	2,907	17,349	80
81	11,868	73,292	5,507	32,561	2,574	14,595	81
82	10,623	61,995	4,883	27,340	2,261	12,164	82
83	9,424	51,922	4,291	22,728	1,968	10,037	83
84	8,289	43,018	3,739	18,691	1,699	8,193	84
85	7,210	35,224	3,221	15,189	1,450	6,608	85

FEMALES	Interest Rate = 5.0%		Interest Rate = 6.0%		Interest Rate = 7.0%		FEMALES
Age	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	D_x	$N_x^{(12)}$	Age
60	51,710	715,452	29,281	367,702	16,669	191,248	60
61	49,026	664,972	27,499	339,237	15,508	175,111	61
62	46,449	617,127	25,808	312,513	14,418	160,103	62
63	43,973	571,812	24,202	287,442	13,395	146,153	63
64	41,591	528,931	22,675	263,940	12,432	133,200	64
65	39,304	488,388	21,225	241,929	11,529	121,181	65
66	37,104	450,092	19,849	221,335	10,680	110,041	66
67	34,988	413,958	18,540	202,086	9,883	99,726	67
68	32,956	379,901	17,298	184,115	9,135	90,186	68
69	31,005	347,839	16,121	167,356	8,434	81,372	69
70	29,132	317,693	15,004	151,747	7,776	73,240	70
71	27,333	289,385	13,945	137,229	7,159	65,747	71
72	25,610	262,842	12,942	123,744	6,583	58,852	72
73	23,950	237,993	11,989	111,238	6,041	52,517	73
74	22,359	214,773	11,087	99,662	5,534	46,709	74
75	20,828	193,115	10,231	88,968	5,059	41,392	75
76	19,364	172,959	9,422	79,108	4,615	36,537	76
77	17,957	154,239	8,655	70,037	4,200	32,111	77
78	16,596	136,906	7,924	61,718	3,809	28,090	78
79	15,290	120,908	7,231	54,112	3,444	24,449	79
80	14,037	106,193	6,576	47,181	3,103	21,161	80
81	12,836	92,706	5,956	40,889	2,784	18,205	81
82	11,685	80,398	5,371	35,201	2,487	15,557	82
83	10,584	69,218	4,819	30,083	2,211	13,197	83
84	9,533	59,115	4,300	25,502	1,954	11,104	84
85	8,530	50,042	3,811	21,426	1,716	9,259	85

2016 EA-2 (Segment F) Examination - Selected Amortization Factors

Segment Rates = {3.0%, 4.0%, 5.0%}

Remaining Period	Amortization Factor
7 years	6.3293
6 years	5.5390
5 years	4.7171
4 years	3.8286
3 years	2.9135
2 years	1.9709

Segment Rates = {5.0%, 6.0%, 7.0%}

Remaining Period	Amortization Factor
7 years	5.9982
6 years	5.2932
5 years	4.5460
4 years	3.7232
3 years	2.8594
2 years	1.9524

Solutions to EA-2(F) Examination
Fall, 2016

Question 1

IRC section 430(h)(5) requires IRS approval for changes in non-prescribed actuarial assumptions when all of 3 conditions are met.

1. The plan is covered by the PBGC. This condition is satisfied due to the exam general conditions.
2. The unfunded vested benefits as of the end of the prior year exceed $50,000,000. This condition is satisfied because the unfunded vested benefits as of 12/31/2016 equal $100,000,000.
3. There is a decrease in the funding shortfall due to a change in assumptions of more than $50,000,000, or there is a decrease in the funding shortfall due to a change in assumptions of more than $5,000,000 and that is at least 5% of the funding target before reflecting the assumption change. 5% of the pre-change funding target is $50,000,000 (5% of $1,000,000,000). This condition is not satisfied because the decrease in the funding target is only $40,000,000. (Note that there is not enough information to know the change in the funding shortfall.)

No IRS approval is required for the change in the non-prescribed assumptions since condition 3 is not satisfied. The statement is false.

Answer is B.

Question 2

A plan can only be in endangered status if it is not in critical status (IRC section 432(b)(1)). A plan is in critical status if it is expected to have a funding deficiency (ignoring any extension of amortization periods) in any of the next 3 years (IRC section 432(b)(2)(B)(ii)). The plan is expected to have a funding deficiency in 2019, which is within 3 years of the 2017 valuation year. The plan is in critical status for 2017, and therefore cannot be considered as in endangered status. The statement is false.

Answer is B.

Question 3

Treasury regulation 1.430(d)-1(c)(1)(ii) provides rules for determining the funding target and target normal cost when dealing with benefits that are not earned based on service or an accrual rate, such as a flat benefit. In this question, the supplemental benefit of $4,800 is a flat benefit that is not accrued or earned based upon years of service. The regulation provides that for purposes of the funding target, it is pro-rated based upon years of service from hire to expected retirement age, and for purposes of the target normal cost, it is pro-rated with one year of that same service.

Smith was hired at age 35, and will have 25 years of service at the expected retirement age of 60. Smith has 15 years of service as of the 1/1/2017 valuation date.

$X = $4,800 × 15/25 = $2,880
$Y = $4,800 × 1/25 = $192

$X + $Y = $2,880 + $192 = $3,072

Answer is C.

Question 4

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

The funding shortfall for 2016 is equal to the excess, if any, of the funding target over the actuarial value of the assets (reduced by the prefunding balance).

The funding shortfall as of 1/1/2016 is:

$2,300,000 – ($2,000,000 - $4,000) = $304,000

The amortization installment (using a 7-year amortization) with regard to the 2016 shortfall amortization base is:

$304,000/5.9982 = $50,682

The **smallest amount that satisfies the minimum funding standard** is equal to the minimum required contribution reduced by the funding balances. The minimum required contribution for 2016 clearly exceeds the $4,000 prefunding balance, so the prefunding balance is used up in 2016 – there is no prefunding balance as of 1/1/2017. (Note that the general conditions of the exam indicate that the employer elects to use the funding balances to reduce the minimum required contribution.)

The funding shortfall as of 1/1/2017 is:

$2,400,000 – $2,150,000 = $250,000

The new 2017 shortfall base is equal to the funding shortfall, less the outstanding balance of the prior shortfall amortization bases. The outstanding balance of the 2016 base is determined by multiplying the 2016 amortization installment by a present value factor using the current (2017) segment rates (note that in this question, the segment rates are the same for 2016 and 2017). For the 2016 base, there are 6 years remaining.

1/1/2017 outstanding balance of 2016 base = $50,682 × 5.2932 = $268,270

2017 shortfall amortization base = $250,000 – $268,270 = ($18,270)

2016 shortfall installment for new base = ($18,270)/5.9982 = ($3,046)

Note that the 6-year amortization factor of 5.2932 and the 7-year amortization factor of 5.9982 were provided in a table with the exam when the segment rates are (5%, 6%, 7%).

1/1/2017 minimum required contribution = $90,000 + $50,682 – $3,046 = $137,636

This is also the **smallest amount that satisfies the minimum funding standard** since there is no prefunding balance.

Answer is D.

Question 5

The **minimum required contribution** is generally equal to the target normal cost plus the amortization of the shortfall amortization bases. However, when the actuarial value of the assets, reduced by the funding balances, is greater than or equal to the funding target, then the shortfall amortization bases are deemed to be fully amortized and the minimum required contribution is equal to the target normal cost, reduced by the excess of the actuarial value of assets (reduced by the funding balances) over the funding target, but not less than zero. See IRC sections 430(a)(2) and 430(c)(6).

The funding balance as of the first day of a plan year is equal to the unused funding balance as of the first day of the prior year, increased using the actual asset rate of return for the prior year. See IRC section 430(f)(8).

Using an 8% rate of return for 2016, the prefunding balance as of 1/1/2017 is:

$$PB_{1/1/2017@8\%} = \$100{,}000 \times 1.08 = \$108{,}000$$

Using a 16% rate of return for 2016, the prefunding balance as of 1/1/2017 is:

$$PB_{1/1/2017@8\%} = \$100{,}000 \times 1.16 = \$116{,}000$$

The actuarial value of assets must be developed as of 1/1/2017 using the actual rate of return for 2016 and the actual transactions in the plan. Other than the 1/1/2016 beginning value of the assets, the only transactions for 2016 were the four contributions made for the year.

$$\begin{aligned} AVA_{1/1/2017@8\%} &= (\$2{,}500{,}000 \times 1.08) + (\$250{,}000 \times 1.08) + (\$250{,}000 \times 1.08^{9/12}) \\ &\qquad + (\$250{,}000 \times 1.08^{6/12}) + (\$250{,}000 \times 1.08^{3/12}) \\ &= \$3{,}749{,}519 \end{aligned}$$

$$\begin{aligned} AVA_{1/1/2017@16\%} &= (\$2{,}500{,}000 \times 1.16) + (\$250{,}000 \times 1.16) + (\$250{,}000 \times 1.16^{9/12}) \\ &\qquad + (\$250{,}000 \times 1.16^{6/12}) + (\$250{,}000 \times 1.16^{3/12}) \\ &= \$3{,}998{,}145 \end{aligned}$$

Using 8%, AVA – PB = \$3,749,519 – \$108,000 = \$3,641,519
Using 16%, AVA – PB = \$3,998,145 – \$116,000 = \$3,882,145

\$X = \$350,000 – (\$3,641,519 - \$3,500,000) = \$208,481
\$Y = \$350,000 – (\$3,882,145 - \$3,500,000) = \$0

\$X – \$Y = \$208,481

Answer is D.

Question 6

The minimum required contribution under the unit credit 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.

Minimum required contribution$_{12/31/2017}$ = (450,000 + 200,000 – 50,000) × 1.07 = 642,000

The ERISA full funding limitation is equal to the accrued liability plus normal cost, rolled forward with valuation interest to the end of the year, less the smaller of the actuarial or market value of the assets (reduced by the credit balance), rolled forward with valuation interest to the end of the year.

ERISA full funding limit$_{12/31/2017}$
= [(3,700,000 + 450,000) – (3,780,000 – 110,000)] × 1.07 = 513,600

The overall full funding limitation is equal to the greater of the ERISA or the RPA'94 full funding limitation. The RPA'94 full funding limitation is equal to 90% of the current liability (including the expected increase in liability due to the current year accruals, also referred to as the current liability normal cost), rolled forward with <u>current liability</u> interest to the end of the year, less the <u>actuarial</u> value of the assets (<u>unreduced</u> by the credit balance), rolled forward with <u>valuation</u> interest to the end of the year.

RPA'94 full funding limit$_{12/31/2017}$
= [90% × (4,300,000 + 550,000) × 1.05] – (3,900,000 × 1.07) = 410,250

The overall full funding limit is equal to the ERISA full funding limit of 513,600. The minimum required contribution is limited to the full funding limit.

The <u>**smallest amount that satisfies the minimum funding standard**</u> is equal to the minimum required contribution (as limited by the full funding limitation), less the credit balance. The minimum required contribution has already been interest adjusted with interest to the end of the year, but the credit balance must also be adjusted (using the valuation interest rate).

$X = 513,600 – (110,000 × 1.07) = 395,900

Answer is C.

Question 7

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).

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 (general conditions of the exam).

The unfunded liability can be developed from the prior year unfunded liability, prior year normal cost, and prior year contribution(s). The current 1/1/2017 unfunded liability (UL) is equal to:

$[(UL_{1/1/2016} + NC_{1/1/2016}) \times (1+i)]$

$\quad -\;$ 2016 contributions (adjusted with interest to 12/31/2016)

$= [(2{,}500{,}000 + 185{,}000) \times 1.07] - (200{,}000 \times 1.07)$

$\quad -\; (100{,}000 \times 1.07^{9/12}) - (100{,}000 \times 1.07^{3/12}) = 2{,}452{,}039$

$$\text{Normal cost}_{1/1/2017} = \frac{12{,}000{,}000 - 8{,}000{,}000 - 2{,}452{,}039)}{50{,}000{,}000 / 5{,}850{,}000} = 181{,}111$$

Answer is B.

Question 8

IRC section 430(i)(5)(B) provides for a transition percentage that is phased in over the first 5 consecutive years that a plan is in at-risk status. The transition percentage is 20% for the first year, 40% for the second year, 60% for the third year, 80% for the fourth year, and 100% for the fifth year. Every time a plan moves from being not at-risk to being at-risk, a new 5-year period begins.

This plan was not at-risk in 2014, and has been at-risk for the 3 consecutive years beginning in 2015. For 2017, the transition percentage is 60%, not 80%. The statement is false.

Answer is B.

Question 9

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 5-year smoothing period.

The adjustment to the 1/1/2017 market value of assets is equal to $\frac{4}{5}$ of the gain/loss during 2016, $\frac{3}{5}$ of the gain/loss during 2015, $\frac{2}{5}$ of the gain/loss during 2014, and $\frac{1}{5}$ of the gain/loss during 2013.

The asset gain/loss for is given for each year.

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.

$$AVA_{1/1/2017} = 361{,}776 - (\tfrac{4}{5} \times 14{,}160) - (\tfrac{3}{5} \times 29{,}336) + (\tfrac{2}{5} \times 22{,}885) - (\tfrac{1}{5} \times 5{,}327)$$
$$= 340{,}935\text{, but not less than } 289{,}421\ (361{,}776 \times 80\%)$$

The actuarial value of assets as of 1/1/2017 is 340,935.

Answer is A.

Question 10

The minimum required contribution for multiemployer plans is equal to the normal cost plus the amortization charges less the amortization credits. (Note that not all cost methods have amortization charges and credits, but since the cost method is not provided in the data for this question, it must be assumed that the method is one with amortization bases.) This is brought forward using the valuation interest rate to the end of the year.

$$\text{Minimum required contribution}_{12/31/2016} = (150{,}000 + 750{,}000 - 475{,}000) \times 1.07 = 454{,}750$$

The credit balance as of 12/31/2016 is equal to the credit balance as of 12/31/2015, increased with the valuation interest rate for one year, plus the accumulated contributions for 2016 as of 12/31/2016 (accumulated using the valuation interest rate), less the minimum required contribution for 2016. Note that employee contributions are not used to increase the credit balance, but employer contributions made with regard to withdrawal liability commitments are used just as any other employer contribution.

$$\text{Accumulated contributions as of 12/31/2016} = (170{,}000 \times 1.07^{9/12}) + (180{,}000 \times 1.07^{4/12}) = 178{,}849 + 184{,}106 = 362{,}955$$

$$\text{Credit balance as of 12/31/2016} = (500{,}000 \times 1.07) + 362{,}955 - 454{,}750 = 443{,}205$$

Answer is D.

Question 11

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 40 on 1/1/2017, 25 years before assumed retirement age (retirement age is assumed to be 65 using the exam general conditions). The interest crediting rate is 4.5%.

Accumulated cash balance account at retirement age = $50{,}000 \times 1.045^{25} = 150{,}272$

Equivalent life annuity payable at age 65 = $150{,}272 \div 11.5 = 13{,}067$

The probability of electing a life annuity is given to be 20%, and the probability of electing a lump sum is given to be 80%. These probabilities must be taken into account in determining the present value for the funding target. Note that since Smith is more than 20 years from retirement, only the segment 3 interest rate of 5% is used. 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>male</u> participant using 5% interest.

$$\text{Funding target} = (80\% \times 150{,}272 \div 1.05^{25}) + \left(20\% \times 13{,}067 \times \frac{N_{65}^{(12)}}{D_{65}} \div 1.05^{25}\right)$$

$$= (80\% \times 150{,}272 \div 1.05^{25}) + \left(20\% \times 13{,}067 \times \frac{459{,}331}{38{,}844} \div 1.05^{25}\right)$$

$$= 35{,}500 + 9{,}126 = 44{,}626$$

Answer is D.

Question 12

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 7% 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 2015, and the segment 3 rate of 6.5% is used to determine the expected earnings for 2016. For purposes of the expected earnings, the contributions, benefit payments and plan-related expenses are all paid mid-year, and only earn 6 months of interest.

The expected earnings for 2015 are:

$$[2{,}300{,}000 \times .05] + [(75{,}000 - 65{,}000 - 17{,}500) \times (1.05^{6/12} - 1] = 114{,}815$$

The expected earnings for 2016 are:

$$[2{,}500{,}000 \times .065] + [(80{,}000 - 65{,}000 - 20{,}000) \times (1.065^{6/12} - 1] = 162{,}340$$

1/1/2015 adjusted fair market value (adjusted to 1/1/2017)
$= 2{,}300{,}000 + (75{,}000 + 80{,}000) - (65{,}000 + 65{,}000)$
$- (17{,}500 + 20{,}000) + (114{,}815 + 162{,}340) = 2{,}564{,}655$

1/1/2016 adjusted fair market value (adjusted to 1/1/2017)
$= 2{,}500{,}000 + 80{,}000 - 65{,}000 - 20{,}000 + 162{,}340 = 2{,}657{,}340$

1/1/2017 actuarial value = (2,825,000 + 2,657,340 + 2,564,655)/3 = 2,682,332

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 2,825,000 is equal to 2,542,500.

The 1/1/2017 actuarial value of assets is equal to 2,682,332.

Answer is C.

Question 13

IRC section 430(e) provides rules regarding amortization of a waived funding deficiency. The base is amortized in 5 equal annual installments, beginning with the year following the year for which the waiver is granted. For the \$190,000 that has been waived for the 2017 plan year, the first amortization installment will be due on 1/1/2018.

The waived deficiency is amortized using the segment rates in effect for the year in which the deficiency was waived (2017 in this question). The first installment is due at the beginning of 2018, and the last installment will be due at the beginning 2022. The segment 1 interest rate applies to the first 4 installments, because they fall within the 5-year period beginning with the 2017 valuation date (1/1/2017 – 12/31/2021). The segment 2 interest rate applies to the last installment.

Setting up an equation of value:

$\$190{,}000 = \$P \times (a_{\overline{4}|5\%} + v_{6\%}^{5})$

$\$P = \$190{,}000/(a_{\overline{4}|5\%} + v_{6\%}^{5}) = \$44{,}256$

Note the use of an annuity immediate for the first 4 payments as the first of those payments is to be made one year after the waiver was granted.

Answer is D.

Question 14

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.

Minimum required contribution$_{12/31/2016}$ = (50,000 + 20,000 – 15,000) × 1.07 = 58,850

The credit balance as of 12/31/2016 is equal to the credit balance as of 12/31/2015, increased with the valuation interest rate for one year, plus the accumulated contributions for 2016 as of 12/31/2016 (accumulated using the valuation interest rate), less the minimum required contribution for 2016.

Accumulated contribution as of 12/31/2016 = 50,000 × $1.07^{6/12}$ = 51,720

Credit balance as of 12/31/2016 = (10,000 × 1.07) + 51,720 – 58,850 = 3,570

The same process is used for 2017 in order to determine the credit balance as of 12/31/2017.

Minimum required contribution$_{12/31/2017}$ = (75,000 + 25,000 – 10,000) × 1.07 = 96,300

Accumulated contribution as of 12/31/2017 = 150,000 × $1.07^{6/12}$ = 155,161

Credit balance as of 12/31/2017 = (3,570 × 1.07) + 155,161 – 96,300 = 62,681

Answer is B.

Question 15

The accrued liability under the unit credit (UC) cost method is equal to the present value of the benefit accrued as of the first day of the plan year. As of 1/1/2017, Smith has 6 years of service. The accrued benefit for Smith is:

Accrued benefit$_{1/1/2017}$ = \$540 × 6 years of service = \$3,240

Smith is age 61 as of the 1/1/2017 valuation date, so the accrued benefit must be discounted from the assumed retirement age of 65 (per the exam general conditions) to age 61, using the given commutation functions. Note that the benefits are payable annually, at the beginning of the year.

$$\text{UC accrued liability}_{1/1/2017} = \$3{,}240 \times \ddot{a}_{65} \times \frac{D_{65}}{D_{61}} = \$3{,}240 \times \frac{N_{65}}{D_{65}} \times \frac{D_{65}}{D_{61}}$$

$$= \$3{,}240 \times \frac{N_{65}}{D_{61}} = \$3{,}240 \times \frac{120{,}394}{15{,}356} = \$25{,}402$$

The accrued liability under the entry age normal (EAN) cost method is equal to the accumulated value of the prior normal costs (as of the valuation date). The normal costs are based upon the <u>projected</u> benefit at assumed retirement age, and are assumed to begin at hire age. Smith was hired at age 55 and will have 10 years of service at normal retirement age.

Projected benefit = \$540 × 10 years of service = \$5,400

The present value of benefits must be determined at entry age (age at hire). As previously mentioned, the given commutation functions are used.

$$\text{PVFB}_{55} = \$5{,}400 \times \ddot{a}_{65} \times \frac{D_{65}}{D_{55}} = \$5{,}400 \times \frac{N_{65}}{D_{55}} = \$5{,}400 \times \frac{120{,}394}{23{,}710} = \$27{,}420$$

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

$$\text{NC}_{55} = \text{PVFB}_{55} \div \frac{N_{55} - N_{65}}{D_{55}} = \$27{,}420 \div \frac{301{,}094 - 120{,}394}{23{,}710} = \$3{,}598$$

The accrued liability is equal to the accumulation of the past normal costs through Smith's current age on 1/1/2017 (6 years of accumulation from age 55 to 61).

EAN $AL_{61} = NC_{55} \times \dfrac{N_{55} - N_{61}}{D_{61}} = \$3,598 \times \dfrac{301,094 - 175,572}{15,356} = \$29,411$

$X = $29,411 – $25,402 = $4,009

Answer is A.

Question 16

IRC section 4971(a)(2) provides that for a multiemployer plan with an accumulated funding deficiency as of the end of a plan year, there is a excise tax equal to 5% of that funding deficiency. However, IRC section 4971(g)(1)(A) provides an exception for a plan that is in critical status for the year. Under that exception, no excise tax is imposed for the year.

Because the plan is certified to be in critical status for 2017, there is no excise tax imposed. The statement is false.

Answer is B.

Question 17

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 for 2017.

Cushion amount = $(50\% \times 28{,}800{,}000) + (34{,}200{,}000 - 28{,}800{,}000) = 19{,}800{,}000$

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

$$2{,}160{,}000 + 28{,}800{,}000 + 19{,}800{,}000 - 25{,}200{,}000 = 25{,}560{,}000$$

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:

$$2{,}520{,}000 + 32{,}400{,}000 - 25{,}200{,}000 = 9{,}720{,}000$$

The deductible limit is the larger of the IRC section 404(o)(2)(A) and 404(o)(2)(B) limits, which is 25,560,000.

Answer is C.

Note: Without regulations for IRC section 404(o), it is unclear as to whether the deductible limit is determined as of the valuation date, or as of the close of the employer's fiscal year (which has traditionally been when the deductible limit is determined). In this question, if 25,560,000 is increased using the 5.0% effective interest rate to 12/31/2017, the result is 27,349,200. This is in the same answer range. Also note that it is given that there have always been more than 500 participants. The cushion amount is adjusted in certain cases for HCEs if the plan has no more than 100 participants, and that exception does not apply to this question

Question 18

The funding target is equal to the present value of the benefit accrued as of the first day of the plan year, using funding assumptions. In this question, the benefit being considered is the supplemental death benefit. Smith will not qualify for the death benefit until age 64, at which point Smith will have 25 year of service. The only age of death for Smith under which the death benefit will be paid is age 64. The 10-year certain death benefit would be paid beginning at the end of that year, if Smith died. The segment 2 interest rate would be used to value that death benefit since all payments would be made between 6 and 20 years from the current 1/1/2017 valuation date. The present value as of Smith's age 64 of the death benefit is:

$\$25{,}000\, a_{\overline{10}|.06} = \$25{,}000 \times 7.360087 = \$184{,}002$

The probability of death at age 64 must be determined. This can be accomplished by looking at the ratio of the commutation functions for D_x at ages 64 and 65. The commutation functions used are found in the tables of supplementary factors provided with the examination, for a <u>male</u> participant using 6% interest.

$D_{65} / D_{64} = v^{65} l_{65} / v^{64} l_{64} = vp_{64} = 20{,}977/22{,}424 \quad \rightarrow \quad p_{64} = 0.9916$

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 the time benefit payment begins. In this question, Smith has 20 years of service as of 1/1/2017, and would have 25 years of service as of age 64 when the death benefit might be paid (it must be assumed that death occurs on the first day of the year). As a result, for purposes of the funding target, only 20/25 of the $184,002 death benefit is taken into account.

$\$X = \$184{,}002 \times (20/25) \times q_{64} \times (D_{64} / D_{59})$
$= \$184{,}002 \times (20/25) \times (1 - 0.9916) \times (22{,}424/30{,}616)$
$= \$906$

Answer is B.

Question 19

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 2017 minimum required contribution = 90% × $200,000 = $180,000

The quarterly contribution due on 4/15/2017 and 7/15/2017 is equal to 25% of $160,000 (because the 2016 minimum required contribution is less than 90% of the 2017 minimum):

25% × $160,000 = $40,000

The employer elects to apply the funding balances to pay for the first two 2017 quarterly required contribution amounts (on 4/15/2017 and 7/15/2017). These are discounted using the 2017 plan effective rate from the quarterly due dates to the first day of the plan year.

($40,000 × $v_{5\%}^{3.5/12}$) + ($40,000 × $v_{5\%}^{6.5/12}$) = $39,435 + $38,957 = $78,392

The funding standard carryover balance must be used before the prefunding balance can be used, so the entire $25,000 funding standard carryover balance is used to pay for the 4/15/2017 quarterly contribution requirement, and the balance for the two quarterly requirements comes from the prefunding balance. The remaining prefunding balance as of 1/1/2017 is:

$65,000 - $78,392 - $25,000 = $11,608

The remaining prefunding balance is increased with interest from 1/1/2017 to 1/1/2018 using the 2017 actual asset rate of return (IRC section 430(f)(8)).

A contribution for 2017 of $200,000 was made on 9/1/2017. This must be discounted to 1/1/2017:

$200,000 × $v_{5\%}^{8/12}$ = $193,599

The minimum required contribution for 2017 is $200,000. Since $193,599 was paid for with the 9/1/2017 employer contribution of $200,000, the remaining $6,401 ($200,000 - $193,599) must be paid for using funding balances. However, the amount of funding balances elected to be used was actually $78,392. This results in an excess contribution of $71,991 ($78,392 - $6,401).

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 (1/1/2018), and the excess contribution is generally increased with interest using the 2017 effective interest rate (IRC section 430(f)(6)(B)(ii)). However, when the reason that there is an excess contribution is due to the election of the funding balances to help to pay for the 2017 minimum required contribution (when a funding balance is elected to be used to pay for a quarterly contribution requirement, it is also deemed to be elected to pay for the minimum required contribution), then the excess contribution being added to the prefunding balance as of 1/1/2018 is increased with the actual asset rate of return for 2017 (as is the remaining prefunding balance from 1/1/2017). See Treasury Regulation 1.430(f)-1(b)(3)(iii). In 2017, the asset rate of return was equal to a loss of 10%, so the prefunding balance is reduced by 10% from 1/1/2017 to 1/1/2018.

Prefunding balance$_{1/1/2018}$ = (\$71,991 + \$11,608) × 90% = \$75,239

Answer is B.

Question 20

The normal cost under the unit credit cost method is equal to the present value of the increase in the accrued benefit for the current year (current year accrual). Smith is age 62 as of the 1/1/2017 valuation date. For purposes of the current year accrual, Smith's 2016 salary must be projected using the 5% salary scale to reflect the expected salary for 2017 through 2019 (Smith's final 3 years of service).

$$\text{Projected salary} = \$63{,}000 \times \frac{1.05 + 1.05^2 + 1.05^3}{3} = \$69{,}513$$

2017 accrual (using projected salary) = 1.3% × \$69,513 = \$903.67

For purposes of determining the present value, the commutation functions used are found in the tables of supplementary factors provided with the examination, for a <u>female</u> participant using 7% interest. Note that pre-retirement mortality is used.

$$\text{Normal cost}_{1/1/2017} = \$903.67 \times \ddot{a}_{65}^{(12)} \times \frac{D_{65}}{D_{62}} = \$903.67 \times \frac{N_{65}^{(12)}}{D_{65}} \times \frac{D_{65}}{D_{62}}$$

$$= \$903.67 \times \frac{N_{65}^{(12)}}{D_{62}} = \$903.67 \times \frac{121{,}181}{14{,}418} = 7{,}595$$

Answer is A.

Question 21

The accrued liability under the unit credit cost method is equal to the present value of the benefit accrued as of the first day of the plan year (based upon projected salary). Smith is age 60 as of the 1/1/2016 valuation date and 61 as of the 1/1/2017 valuation date. For purposes of determining final salary with regard to each valuation date, Smith's 2015 salary must be projected using the 3.5% salary scale for 5 years, and Smith's 2016 salary must be projected using the 3.5% salary scale for 4 years.

Projected salary (using 2015 salary) = \$60,000 × 1.035^5 = \$71,261

Projected salary (using 2016 salary) = \$70,000 × 1.035^4 = \$80,327

Increase in projected salary = \$80,327 - \$71,261 = \$9,066

For purposes of determining the present value, the commutation functions used are found in the tables of supplementary factors provided with the examination, for a <u>female</u> participant using 5% interest. Note that there are no assumed pre-retirement decrements due to the exam general conditions.

The 2016 compensation experience is reflected in the 1/1/2017 valuation, at which time Smith is age 61 with 17 years of service.

The increase in the "projected" accrued benefit as of 1/1/2017 is:

1.5% × \$9,066 × 17 years of service = \$2,311.83

$$\$X = \$2{,}311.83 \times \ddot{a}_{65}^{(12)} \times v_{5\%}^{4} = \$2{,}311.83 \times \frac{N_{65}^{(12)}}{D_{65}} \times 0.822702$$

$$= \$2{,}311.83 \times \frac{488{,}388}{39{,}304} \times 0.822702 = \$23{,}633$$

Answer is D.

Question 22

IRC section 430(j)(3)(A) requires that if there was a funding shortfall for the preceding year, then quarterly contributions are required to be made for a plan year. There was a funding shortfall in 2016 since the FTAP was less than 100%. 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 since the plan had 250 participants on 1/1/2016.

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 (3/31/2017 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 4/1/2016 through 3/31/2017 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 (85% for 2017). See IRC section 430(j)(4)(E)(iv).

Total $\text{disbursements}_{3/31/2017}$

$$= \$400{,}000 + \$45{,}000 + \$125{,}000 + \$35{,}000 = \$605{,}000$$

Adjusted $\text{disbursements}_{3/31/2017} = \$605{,}000 - [85\% \times (\$45{,}000 + \$125{,}000)] = \$460{,}500$

Liquidity $\text{shortfall}_{3/31/2017} = (3 \times \$460{,}500) - \$1{,}200{,}000 = \$181{,}500$

The contribution of $X due on 4/15/2017 is equal to the greater of the quarterly contribution required ($100,000) or the liquidity shortfall ($181,500). This is $181,500.

Answer is D.

Note that the question could have been worded better, as the contribution required on 4/15/2017 is more than enough to pay for the quarterly contribution. The intent of the question (by asking for the amount of "liquid assets") was to determine the liquid contribution to be made by 4/15/2017 that would satisfy both the quarterly contribution requirement and the liquidity requirement.

Question 23

The funding target is equal to the present value of the benefit accrued as of the first day of the year. Smith is age 42 on 1/1/2017, with 15 years of service. Salary cannot be projected for purposes of the funding target, so the final 3-year average salary must be equal to an average of the salary from the years 2014 through 2016.

The final 3-year average salary as of 1/1/2017 is:

$$\text{Expected} = \frac{63{,}000 + 66{,}000 + (66{,}000 \times 1.05)}{3} = 66{,}100$$

$$\text{Actual} = \frac{63{,}000 + 66{,}000 + 63{,}000}{3} = 64{,}000$$

The decrease in the actual salary compared to the expected salary is 2,100 (66,100 – 64,000). This decrease will be used to determine the decrease in the funding target.

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

$$X = 2\% \times 2{,}100 \times 15 \text{ years of service} \times \ddot{a}_{65}^{(12)} \times v_{7\%}^{23} = 630 \times \frac{N_{65}^{(12)}}{D_{65}} \times 0.210947$$

$$= 630 \times \frac{115{,}172}{11{,}394} \times 0.210947 = 1{,}343$$

Answer is A.

Question 24

When the fair market value method is used to value the assets for a single employer plan, the contributions receivable must be discounted to the first day of the current year using the prior year plan effective rate, and included in the market value of assets (IRC section 430(g)(4)(A)).

Actuarial value of $\text{assets}_{1/1/2017} = 1{,}470{,}000 + (300{,}000/1.06^{6/12}) = 1{,}761{,}386$

Answer is C.

Question 25

IRC section 430(c)(5) provides that a single employer plan is exempt from creating a shortfall amortization base for a plan year if the actuarial value of the assets (reduced by the prefunding balance if the employer elects to use any of the prefunding balance to pay for any of the minimum required contribution, and not reduced by the funding standard carryover balance) is at least as large as the funding target. In this question, there is no prefunding balance. The actuarial value of the assets of $6,500,000 is larger than the funding target of $5,800,000, so the plan is exempt from creating a new shortfall amortization base for the 2017 year. The statement is true.

Answer is A.

Question 26

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

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

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 2017 compensation, it can be assumed that the benefit is compensation-based.

$$\text{Normal cost} = \frac{\$40{,}000{,}000 - (\$28{,}000{,}000 - \$500{,}000)}{\$60{,}000{,}000 / \$8{,}000{,}000} = \$1{,}666{,}667$$

The **smallest amount that satisfies the minimum funding standard** as of 12/31/2017 is equal to the normal cost, reduced by the credit balance, and increased with interest from the valuation date of 1/1/2017 to the last day of the year.

$X = ($1,666,667 – $500,000) × 1.07 = $1,248,334

Answer is B.

Question 27

The funding target is equal to the present value of the benefit accrued as of the first day of the year. The accrued benefit as of 1/1/2017 is given to be \$58,800. Smith is currently age 40, more than 20 years from assumed retirement age 65 (per the exam general conditions), so the segment 3 interest rate is used for purposes of the preseent value.

It is assumed that there is a 100% probability that a lump sum is elected. For funding purposes, the plan mortality assumptions are used post-retirement (applicable mortality table, in this question), the IRC section 430 mortality is used for pre-retirement mortality, and the segment rates are used both pre-retirement and post-retirement.

Lump sum value of accrued benefit = \$58,800 × 10.33 = \$607,404

Note that the annual life annuity factor, payable monthly, is used because under the exam general conditions, it is assumed that benefits are payable monthly.

For purposes of discounting the lump sum the funding assumptions are used (segment 3 interest rate and funding mortality).

$$\text{Funding target}_{1/1/2017} = \$607{,}404 \times \frac{D_{65}}{D_{40}} = \$607{,}404 \times \frac{11{,}394}{65{,}983} = \$104{,}887$$

Answer is D.

Question 28

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 increase in the accrued benefit during 2017. The accrued benefit as of the first day of the 2017 plan year is determined using only salary history through 2016. The accrued benefit determined as of 12/31/2017 includes assumed salary increases for 2017. In this question the assumed salary increase is 2%, so Smith's assumed 2017 salary is \$102,000 (\$100,000 × 1.02).

3-year average salary as of 1/1/2017 = $\dfrac{\$88{,}000+\$97{,}000+\$100{,}000}{3}$ = \$95,000

3-year average salary as of 12/31/2017 = $\dfrac{\$97{,}000+\$100{,}000+\$102{,}000}{3}$ = \$99,667

Smith has 25 years of service (the maximum service allowed to be used for the normal retirement benefit) as of 1/1/2017. Those 25 years are used for both the beginning and end of year accrued benefits in 2017. For purposes of the target normal cost,

Accrued benefit$_{1/1/2017}$ = 2% × \$95,000 × 25 years of service = \$47,500.00
Accrued benefit$_{12/31/2017}$ = 2% × \$99,667 × 25 years of service = \$49,833.50
Benefit for target normal cost = \$49,833.50 – \$47,500.00 = \$2,333.50

Smith is 5 years from normal retirement age 65 (assumed per the general conditions of the exam), so the segment 2 interest rate of 6% is used to discount retirement benefits paid from age 65 through age 80, and the segment 3 interest rate of 7% is used to discount benefits paid at age 80 and later. 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.

$$\text{Target normal cost} = \$2{,}333.50 \times \left[\frac{N^{(12)}_{65@6\%} - N^{(12)}_{80@6\%}}{D_{65@6\%}} v^5_{6\%} + \frac{N^{(12)}_{80@7\%}}{D_{65@7\%}} v^5_{7\%}\right]$$

$$= \$2{,}333.50 \times \left[\frac{228{,}812 - 38{,}423}{20{,}977}(0.747258) + \frac{17{,}349}{11{,}394}(0.712986)\right]$$

$$= \$18{,}360$$

The funding shortfall is equal to the funding target reduced by the actuarial value of assets (which is reduced by the funding balances, if any). The funding target is equal to the present value of the benefit accrued as of the first day of the year.

$$\text{Funding target} = \$47{,}500.00 \times \left[\frac{N^{(12)}_{65@6\%} - N^{(12)}_{80@6\%}}{D_{65@6\%}} v^5_{6\%} + \frac{N^{(12)}_{80@7\%}}{D_{65@7\%}} v^5_{7\%} \right]$$

$$= \$47{,}500.00 \times \left[\frac{228{,}812 - 38{,}423}{20{,}977}(0.747258) + \frac{17{,}349}{11{,}394}(0.712986) \right]$$

$$= \$373{,}721$$

Funding shortfall = \$373,721 – \$380,000 = \$0

When the funding shortfall for the year is \$0 (the actuarial value of the assets is greater than or equal to the funding target), then there are no amortization bases. See IRC sections 430(c)(4) and 430(c)(6). In addition, when the actuarial value of the assets is greater than the funding target, the target normal cost is reduced by the excess (IRC section 430(a)(2)).

Minimum required contribution for 2017 = \$18,360 – (\$380,000 – \$373,721)
= \$12,081

Answer is C.

Question 29

The \$200,000 contribution for 2017 made on 12/31/2017 must be discounted to 1/1/2017 (the valuation date), generally using the effective interest rate of 6%. However, \$100,000 of this is needed to pay for the 4/15/2017 quarterly contribution requirement and the remaining \$100,000 is needed to pay for the 7/15/2017 quarterly contribution requirement. The 4/15/2017 contribution is late by 8½ months, and an additional 5 percentage points (for a total 11% rate) must be used to discount the \$100,000 contribution needed to satisfy that quarterly contribution requirement for those 8½ months (and then discounted using 6% for the remaining period). The 7/15/2017 contribution is late by 5½ months, so the 11% rate must be used to discount the second \$100,000 contribution for 5½ months (and then discounted using 6% for the remaining period).

The value as of 1/1/2017 of the contribution made on 12/31/2017 is:

$(\$100{,}000 \times v_{11\%}^{8.5/12} \times v_{6\%}^{3.5/12}) + (\$100{,}000 \times v_{11\%}^{5.5/12} \times v_{6\%}^{6.5/12}) = \$183{,}677$

1/1/2017 funding deficiency = \$500,000 – \$183,677 = \$316,323

IRC section 4971 requires a 10% excise tax to be paid on any unpaid minimum required contribution for a single employer plan.

\$X = \$316,323 × 10% = \$31,632

Answer is D.

Question 30

The **<u>minimum required contribution</u>** 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 increase in the accrued benefit during 2016. This increase is \$400 per month under the original plan provisions, and \$500 per month under the plan amendment.

Smith is 20 years from normal retirement age 65 (assumed per the general conditions of the exam) as of 1/1/2016, and 19 years from retirement age as of the valuation date of 12/31/2016. The segment 2 interest rate of 6% is used to discount retirement benefits paid at age 65 (benefits paid between 6 and 20 years from the valuation date), and the segment 3 interest rate of 7% is used to discount benefits paid at age 66 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>female</u> participant using 6% and 7% interest.

$$\text{Target normal cost (old plan)} = \$400 \times 12 \times \left[\frac{N^{(12)}_{65@6\%} - N^{(12)}_{66@6\%}}{D_{65@6\%}} v^{19}_{6\%} + \frac{N^{(12)}_{66@7\%}}{D_{65@7\%}} v^{19}_{7\%} \right]$$

$$= \$4{,}800 \times \left[\frac{241{,}929 - 221{,}335}{21{,}225}(0.330513) + \frac{110{,}041}{11{,}529}(0.276508) \right]$$

$$= \$14{,}207$$

$$\text{Target normal cost (new plan)} = \$500 \times 12 \times \left[\frac{N^{(12)}_{65@6\%} - N^{(12)}_{66@6\%}}{D_{65@6\%}} v^{19}_{6\%} + \frac{N^{(12)}_{66@7\%}}{D_{65@7\%}} v^{19}_{7\%} \right]$$

$$= \$6{,}000 \times \left[\frac{241{,}929 - 221{,}335}{21{,}225}(0.330513) + \frac{110{,}041}{11{,}529}(0.276508) \right]$$

$$= \$17{,}759$$

The funding shortfall is equal to the funding target reduced by the actuarial value of assets (which is reduced by the funding balances, if any – there is no funding balance in this question). The funding target is equal to the present value on the valuation date (12/31/2016) of the benefit accrued as of the first day of the year. Smith has 2 years of service as of 1/1/2016. The 1/1/2016 accrued benefit under the original and amended plans is:

Accrued benefit old plan = \$400 × 2 years of service = \$800
Accrued benefit old plan = \$500 × 2 years of service = \$1,000

The funding target and funding shortfall as of 12/31/2016 under the original and amended plans is:

$$\text{Funding target (old plan)} = \$800 \times 12 \times \left[\frac{N^{(12)}_{65@6\%} - N^{(12)}_{66@6\%}}{D_{65@6\%}} v^{19}_{6\%} + \frac{N^{(12)}_{66@7\%}}{D_{65@7\%}} v^{19}_{7\%} \right]$$

$$= \$9{,}600 \times \left[\frac{241{,}929 - 221{,}335}{21{,}225}(0.330513) + \frac{110{,}041}{11{,}529}(0.276508) \right]$$

$$= \$28{,}415$$

Funding shortfall (old plan) = \$28,415 - \$30,000 = \$0

$$\text{Funding target (new plan)} = \$1{,}000 \times 12 \times \left[\frac{N^{(12)}_{65@6\%} - N^{(12)}_{66@6\%}}{D_{65@6\%}} v^{19}_{6\%} + \frac{N^{(12)}_{66@7\%}}{D_{65@7\%}} v^{19}_{7\%} \right]$$

$$= \$12{,}000 \times \left[\frac{241{,}929 - 221{,}335}{21{,}225}(0.330513) + \frac{110{,}041}{11{,}529}(0.276508) \right]$$

$$= \$35{,}519$$

Funding shortfall (new plan) = \$35,519 - \$30,000 = \$5,519

When the funding shortfall for the year is \$0 (the actuarial value of the assets is greater than or equal to the funding target), then there are no amortization bases. See IRC sections 430(c)(4) and 430(c)(6). In addition, when the actuarial value of the assets is greater than the funding target, the target normal cost is reduced by the excess (IRC section 430(a)(2)). This is the case under the old plan. The **minimum required contribution** as of 12/31/2016 under the old plan is:

\$14,207 – (\$30,000 – \$28,415) = \$12,622

There is a shortfall amortization base under the new plan. The shortfall amortization base is amortized over 7 years using the 2016 segment rates. The amortization factor is found in a table provided with the exam.

Amortization of 2016 shortfall base for new plan = \$5,519 ÷ 5.9982 = \$920

The **minimum required contribution** as of 12/31/2016 under the new plan is:

\$17,759 + \$920 = \$18,679

\$X = \$18,679 – \$12,622 = \$6,057

Answer is D.

Question 31

When a funding balance is used to reduce the minimum required contribution, the prefunding balance may not be elected to be used in the case where there is still a funding standard carryover balance (IRC section 430(f)(3)(B)). This plan has a funding standard carryover balance of $74,000. The plan sponsor may not elect to use only the prefunding balance to reduce the 2017 minimum required contribution. The statement is false.

Answer is B.

Question 32

The minimum required contribution for a multiemployer plan using the unit credit 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 normal cost provided is based upon the plan provisions before the plan amendment. The normal cost is equal to the present value of the benefit accrual for the year. The given normal cost can be increased proportionally based upon the percentage increase in the 2017 accrual due to the plan amendment.

Normal cost (reflecting plan amendment) as of 1/1/2017 = $\$125{,}000 \times \dfrac{27.50}{25.00} = \$137{,}500$

A new amortization base must be created reflecting the increase in the accrued liability due to the plan amendment. The accrued liability using the unit credit cost method is equal to the present value of the benefit accrual due to service from prior years. The given accrued liability can be increased proportionally based upon the percentage increase in the retroactive past accruals due to the plan amendment. Note that only active participants will receive the larger accrual.

Accrued liability (prior to reflecting plan amendment) as of 1/1/2017

$= \$1{,}000{,}000 + \$1{,}500{,}000 = \$2{,}500{,}000$

Accrued liability (reflecting plan amendment) as of 1/1/2017

$= (\$1{,}000{,}000 \times \dfrac{27.50}{25.00}) + \$1{,}500{,}000 = \$2{,}600{,}000$

Increase in accrued liability due to plan amendment

$= \$2{,}600{,}000 - \$2{,}500{,}000 = \$100{,}000$

The increase in the accrued liability due to the plan amendment becomes a new amortization base (charge base) that is amortized over a period of 15 years using the valuation interest rate.

New amortization charge as of 1/1/2017 = $\dfrac{\$100{,}000}{\ddot{a}_{\overline{15}|.07}}$ = \$10,261

Minimum required contribution$_{12/31/2017}$

$$= (\$137{,}500 + \$85{,}000 - \$15{,}000 + \$10{,}261) \times 1.07 = \$233{,}004$$

The credit balance as of 12/31/2017 is equal to the credit balance as of 12/31/2016, increased with the valuation interest rate for one year, plus the accumulated contributions for 2017 as of 12/31/2017 (accumulated using the valuation interest rate – not needed in this question because the contribution is made on 12/31/2017), less the minimum required contribution for 2017.

Accumulated contribution as of 12/31/2017 = \$200,000

Credit balance as of 12/31/2017 = (\$50,000 × 1.07) + \$200,000 – \$233,004 = \$20,496

Answer is C.

Question 33

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 5-year smoothing period.

The adjustment to the 1/1/2017 market value of assets is equal to $\frac{4}{5}$ of the gain/loss during 2016, $\frac{3}{5}$ of the gain/loss during 2015, $\frac{2}{5}$ of the gain/loss during 2014, and $\frac{1}{5}$ of the gain/loss during 2013.

The asset gain/loss for is given for each year, except for 2016. The asset gain/loss for 2016 is equal to the difference between the actual market value of assets as of 1/1/2017 (9,300,000) and the expected value of assets. The expected value is determined by calculating the expected 2016 earnings using the valuation interest rate of 7.5%.

Expected $AVA_{1/1/2017}$

$$= (8{,}300{,}000 \times 1.075) + (350{,}000 \times 1.075^{6/12}) - (225{,}000 \times 1.075^{6/12}) = 9{,}052{,}103$$

There is a gain for 2016 because the actual value of assets is greater than the expected value of assets.

2016 experience gain = 9,300,000 – 9,052,103 = 247,897

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.

$AVA_{1/1/2017}$

$$= 9{,}300{,}000 - (\tfrac{4}{5} \times 247{,}897) - (\tfrac{3}{5} \times 146{,}000) + (\tfrac{2}{5} \times 330{,}000) - (\tfrac{1}{5} \times 120{,}000)$$

$$= 9{,}122{,}082, \text{ but not less than } 7{,}440{,}000\ (9{,}300{,}000 \times 80\%)$$

The actuarial value of assets as of 1/1/2017 is 9,122,082

Answer is A.

Question 34

The accrued liability using the unit credit cost method is equal to the present value of the benefit accrual due to service from prior years. In this question, there are two components to the accrued liability – the accrued liability with respect to the retirement benefit, and the accrued liability with respect to the disability benefit.

Smith is age 50 with 25 years of past service as of 1/1/2017.

Accrued $\text{benefit}_{1/1/2017}$ = \$50 × 25 years of service = \$1,250

This accrued benefit is payable beginning at age 65 (the normal retirement age under the exam general conditions) if Smith retires at age 65, but is payable beginning at age 55 (unreduced) if Smith becomes disabled prior to age 55. The probability of becoming disabled for each year prior to age 55 is 3%, so the probability of not becoming disabled each year is 97%.

Probability of Smith not becoming disabled prior to age 55 = ${}_5p_{50} = (0.97)^5 = 0.858734$

Probability of Smith becoming disabled prior to age 55 = $1 - {}_5p_{50}$
$= 1 - 0.858734 = 0.141266$

With regard to the retirement benefit:

Present value of accrued benefit = \$1,250 × 12 × $\ddot{a}_{65}^{(12)}$ (healthy life) × v^{15} × 0.858734
= \$15,000 × 10.93 × 0.388827 × 0.858734
= \$54,743

With regard to the disability benefit:

Present value of accrued benefit = \$1,250 × 12 × $\ddot{a}_{55}^{(12)}$ (disabled life) × v^{5} × 0.141266
= \$15,000 × 11.12 × 0.729881 × 0.141266
= \$17,198

Accrued liability = \$54,743 + \$17,198 = \$71,941

Answer is B.

Question 35

A contribution that is made prior to the end of the minimum funding period (8½ months after the end of the plan year) can be elected by the employer to apply to that plan year. (See IRC section 430(j)(1).)

The minimum funding period for the 2017 plan year ends on 9/15/2018, and the minimum funding period for the 2018 plan year ends on 9/15/2019. The contribution of $20,000 made on 1/1/2018 is made prior to the expiration of the minimum funding period for each of the 2017 and 2018 plan years. Therefore, it can be elected to apply to either plan year. The election to have it apply to the 2018 plan year is allowed. The statement is true.

Answer is A.

Note: A payment made before the first day of a plan year cannot be elected to be used for that plan year (Treasury regulation 1.430(j)-1(b)(1)). In this question, the $20,000 contribution is made on the first day of the 2018 plan year, so it can be elected to apply to that plan year even though the 2017 plan year has not yet been fully funded. Treasury regulation 1.430(j)-1(b)(3)(ii) makes it clear that the $20,000 contribution could be elected to be used for either the 2017 or 2018 plan year.

Question 36

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

The funding shortfall for 2017 is equal to the excess, if any, of the funding target over the actuarial value of the assets (reduced by the prefunding balance).

The funding shortfall as of 1/1/2017 is:

$505,000 – ($496,000 – $1,000) = $10,000

The new 2017 shortfall base is equal to the funding shortfall, less the outstanding balance of the prior shortfall amortization bases. The outstanding balance of the prior bases is determined by multiplying the amortization installments by a present value factor using the current (2017) segment rates. For the 2015 base there are 5 years remaining, and for the 2016 base there are 6 years remaining.

1/1/2017 outstanding balance of 2015 base = $40,000 × 4.5460 = $181,840

1/1/2017 outstanding balance of 2016 base = ($5.000) × 5.2932 = ($26,466)

2017 shortfall amortization base = $10,000 – ($181,840 – $26,466) = ($145,374)

Note that a new amortization base can be negative, and is created provided the funding shortfall for the year is positive, as it is in this question. Note that under IRC section 430(c)(5), there is an exemption for creating a new shortfall amortization base in the case where the actuarial value of assets (reduced by the prefunding balance provided the employer elects to use any part of it to reduce the minimum required contribution for the year – which is assumed under the exam general conditions) is greater than or equal to the funding target. There is no exemption in this question, because the funding target of $505,000 exceeds the actuarial value of assets.

2017 shortfall installment for new base = ($145,374)/5.9982 = ($24,236)

Total 2017 shortfall installment = $40,000 – $5,000 – $24,236 = $10,764

Note that the 5-year amortization factor of 4.5460, the 6-year amortization factor of 5.2932 and the 7-year amortization factor of 5.9982 were provided in a table with the exam when the segment rates are (5%, 6%, 7%).

1/1/2017 minimum required contribution = $50,000 + $10,764 = $60,764

The **smallest amount needed to satisfy the minimum funding standard** is the minimum required contribution, reduced by the prefunding balance.

$X = $60,764 – $1,000 = $59,764

Answer is C.

Question 37

IRC section 430(f)(3) allows a plan sponsor to elect to apply part or all of a funding balance in order to reduce the employer contribution needed to satisfy the minimum required contribution. This election cannot be made if the ratio of the actuarial value of the assets (reduced by the prefunding balance, but not the funding standard carryover balance) to the funding target is at least 80% as of the prior year valuation date.

This funded percentage used to determine whether the prefunding balance can be used to reduce the 2018 minimum required contribution is determined as of 1/1/2017. The actuarial value of assets and funding target are provided as of that date, but the prefunding balance must be developed.

For 2016, there is a contribution of $110,000 made on 1/1/2017. This must be discounted using the 2016 plan effective rate to 1/1/2016.

Discounted contribution for 2016 = $110,000 ÷ 1.05 = $104,762

There is an excess contribution made for 2016 of $9,762 ($104,762 - $95,000). IRC section 430(f)(6)(B) allows the employer to elect to increase the prefunding balance by any excess contribution. The general conditions of the exam state that the employer makes this election. This excess contribution is added to the prefunding balance as of the first day of the next year (1/1/2017), and is increased with interest using the plan effective rate for the plan year for which the excess contribution is made.

Addition to prefunding balance as of 1/1/2017 = $9,762 × 1.05 = $10,250

It was unnecessary for the employer to elect to use $6,000 of the funding standard carryover balance (which must be used before the prefunding balance according to IRC section 430(f)(3)(B)) to pay for the minimum required contribution because there was an excess contribution made. The $6,000 is therefore added to the prefunding balance, and increased with interest using the asset rate of return (which would have been used had the balance remained as part of the funding standard carryover balance). See Treasury regulation 1.430(f)-1(b)(3)(iii). In addition, the existing prefunding balance of $500 grows using the 2016 actual asset rate of return of 15% (IRC section 430(f)(8)).

Prefunding $\text{balance}_{1/1/2017}$ = ($500 × 1.15) + $10,250 + ($6,000 × 1.15) = $17,725

$$X\% = \frac{\$200{,}000 - \$17{,}725}{\$195{,}000} = 93.47\%$$

Answer is C.

Question 38

Treasury regulation 1.430(d)-1(f)(2) provides that for plans with fewer than 100 participants and beneficiaries, the actuary can assume no pre-retirement mortality decrements if it is a reasonable assumption. The statement is false.

Answer is B.

Question 39

The target normal cost is equal to the present value of the increase in the accrued benefit during 2017. The accrued benefit as of the first day of the 2017 plan year is determined using only salary history and benefit limits in effect as of 1/1/2017. The accrued benefit as of the last day of the year is determined by including projected 2017 salary (using the 10% assumed salary increase) and benefit limits in effect as of 12/31/2017.

The final 3-year average salary can be determined as of both the beginning and end of 2017. As of 1/1/2017, this is \$125,000 (Smith's salary in each prior year). As of 12/31/2017, the final 3-year average salary is:

$$\frac{\$125{,}000 + \$125{,}000 + (\$125{,}000 \times 1.10)}{3} = \$129{,}167$$

The accrued benefit as of the first and last day of the year can be determined. Smith has 7 years of service as of 1/1/2017 and 8 years of service as of 12/31/2017.

1/1/2017 accrued benefit = 12.5% × \$125,000 × 7 years of service = \$109,375
12/31/2017 accrued benefit = 12.5% × \$129,167 × 8 years of service = \$129,167

The limitation of IRC section 415(b) must be considered with regard to both the beginning and end of year accrued benefits. Smith entered the plan on 1/1/2013 (this is the plan effective date, and immediate entry is assumed under the plan general conditions) and has 4 years of plan participation as of 1/1/2017 and 5 years of plan participation as of 12/31/2017. The IRC section 415(b) dollar limit for 2017 is assumed to be \$215,000. This is reduced when years of plan participation are less than 10, as is the case for Smith.

1/1/2017 IRC section 415(b) dollar limit = $\frac{4}{10}$ × \$215,000 = \$86,000
12/31/2017 IRC section 415(b) dollar limit = $\frac{5}{10}$ × \$215,000 = \$107,500

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

1/1/2017 IRC section 415(b) percent of salary limit = $\frac{7}{10}$ × \$125,000 = \$87,500
12/31/2017 IRC section 415(b) percent of salary limit = $\frac{8}{10}$ × \$129,167 = \$103,334

The overall 415(b) limit is equal to the smaller of the dollar limit and the percent of salary limit. This is:

1/1/2017 IRC section 415(b) limit = \$86,000
12/31/2017 IRC section 415(b) limit = \$103,334

These are each less than the plan accrued benefit, so the accrued benefit is limited to the IRC section 415 limit both at the beginning and the end of 2017.

Smith is 5 years from normal retirement age 65 (assumed under the exam general conditions), so the segment 2 interest rate of 6% is used to discount retirement benefits paid from age 65 through age 80, and the segment 3 interest rate of 7% is used to discount benefits paid at age 80 and later. A preretirement mortality decrement is used. 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.

$$\begin{aligned}\text{Target normal cost} &= (\$103{,}334 - \$86{,}000) \times \left[\frac{N^{(12)}_{65@6\%} - N^{(12)}_{80@6\%}}{D_{60@6\%}} + \frac{N^{(12)}_{80@7\%}}{D_{60@7\%}}\right] \\ &= \$17{,}334 \times \left[\frac{241{,}929 - 47{,}181}{29{,}281} + \frac{21{,}161}{16{,}669}\right] \\ &= \$137{,}294\end{aligned}$$

Answer is C.

Question 40

When funding balances are used to pay for required quarterly contributions, the amounts of the quarterly contributions are discounted using the plan effective interest rate from the due date of the quarterly contribution to the first day of the plan year. The due dates of quarterly contributions for a calendar year plan are April 15, July 15, October 15, and January 15 of the following year. The discounted value of the quarterly contributions for 2016 as of 1/1/2016 is:

$(\$22{,}500 \times v_{6\%}^{3.5/12}) + (\$22{,}500 \times v_{6\%}^{6.5/12}) + (\$22{,}500 \times v_{6\%}^{9.5/12}) + (\$22{,}500 \times v_{6\%}^{12.5/12})$
= \$22,121 + \$21,801 + \$21,485 + \$21,175 = \$86,582

The funding standard carryover balance is used before any of the prefunding balance can be used, so the entire \$10,000 funding standard carryover balance is used to pay for the quarterly contributions, and \$76,582 of the prefunding balance is used to pay for the quarterly contributions, leaving an additional \$13,418 of prefunding balance as of 1/1/2016.

Funding balances that are used to pay for the quarterly contributions are also deemed to be elected to be used to pay for the minimum required contribution. In addition to the funding balance, there was a \$120,000 contribution paid on 3/1/2017 for 2016. The discounted value of the contribution as of 1/1/2016 is:

$\$120{,}000 \times v_{6\%}^{14/12} = \$112{,}113$

The minimum required contribution was only \$100,000, so counting both the actual contribution and the election to use funding balances to pay for the quarterly contributions, there is an excess contribution to the plan.

2016 excess contribution = \$112,113 + \$86,582 – \$100,000 = \$98,695

Of this excess contribution, \$12,113 is attributable to the actual contribution made, and \$86,582 is attributable to the use of the funding balances.

The general conditions of the exam state that the employer elects to add any excess contribution to the prefunding balance, which is done as of the first day of the next year (1/1/2017). Generally, the excess contribution is increased using the valuation interest rate for the current year (2016). However, when part of the excess contribution is attributable to the use of the funding balances to pay for the minimum required contribution, that portion of the excess contribution is increased using the actual asset rate of return (2% for 2016) instead of the plan effective rate. In addition, any remaining funding balance is increased to the next plan year using the actual asset rate of return for the current plan year.

1/1/2017 prefunding balance = ($13,418 × 1.02) + ($12,113 × 1.06) + ($86,582 × 1.02)
= $114,840

Answer is B.

Question 41

The expected unfunded accrued liability using the Entry Age Normal (EAN) method is equal to the sum of the prior year unfunded accrued liability and the prior year normal cost, increased with interest using the valuation interest rate to the current valuation date, and reduced by the contribution(s) for the prior year, increased with interest from the date contributed to the current valuation date. The unfunded accrued liability is equal to the accrued liability less the actuarial value of the assets.

The normal cost under the entry age normal funding method is based upon the <u>projected</u> benefit at assumed retirement age (65 in this question, per the general conditions of the exam), and is assumed to begin at hire age (regardless of the actual date of entry into the plan). The accrued liability under EAN is equal to the accumulated value of the prior normal costs (as of the valuation date).

Each participant was hired at age 60, has 2 years of service as of 1/1/2017, and will have 5 years of service at age 65.

Projected benefit for each participant at age 65 = \$125 × 5 years of service = \$625

The normal cost and accrued liability as of 1/1/2017 is:

$$\text{Normal cost} = \$625 \times 12 \times 10 \times \ddot{a}_{65}^{(12)} \times v^5 \div \ddot{a}_{\overline{5}|.07} = \$75{,}000 \times \frac{N_{65}^{(12)}}{D_{65}} \times v^5 \div \ddot{a}_{\overline{5}|.07}$$

$$= \$75{,}000 \times \frac{115{,}172}{11{,}394} \times v^5 \div \ddot{a}_{\overline{5}|.07} = \$123{,}204$$

$$\text{Accrued liability} = \$123{,}204 \times \ddot{s}_{\overline{2}|.07} = \$272{,}885$$

Note that the commutation functions used are found in the tables of supplementary factors provided with the examination, for a <u>male</u> participant 7% interest. The general conditions of the exam state that there are no pre-retirement decrements, so the pre-retirement adjustment is for interest only.

The contributions to the plan for 2017 were \$123,204 made on 7/1/2017 and \$60,000 made on 12/1/2017.

The 1/1/2018 expected unfunded accrued liability is:

$$([(\$272{,}885 - \$190{,}000) + \$123{,}204] \times 1.07)$$
$$- (\$123{,}204 \times 1.07^{6/12}) - (\$60{,}000 \times 1.07^{1/12}) = \$32{,}733$$

Answer is B.

Question 42

Smith has retired on the 1/1/2017 valuation date at age 65. The segment 1 interest rate of 5% is used to discount retirement benefits paid from age 65 to age 70 (benefits paid within 5 years from the valuation date). The segment 2 interest rate of 6% is used to discount retirement benefits paid from age 70 to age 85 (benefits paid between 6 and 20 years from the valuation date), and the segment 3 interest rate of 7% is used to discount benefits paid at age 85 and later. The commutation functions used are found in the tables of supplementary factors provided with the examination, for a <u>male</u> participant using 5%, 6%, and 7% interest.

$$\text{Life annuity} = \left[\frac{N^{(12)}_{65@5\%} - N^{(12)}_{70@5\%}}{D_{65@5\%}} + \frac{N^{(12)}_{70@6\%} - N^{(12)}_{85@6\%}}{D_{65@6\%}} + \frac{N^{(12)}_{85@7\%}}{D_{65@7\%}} \right]$$

$$= \left[\frac{459{,}331 - 291{,}062}{38{,}844} + \frac{139{,}909 - 15{,}189}{20{,}977} + \frac{6{,}608}{11{,}394} \right] = 10.8574$$

The life with 20 year certain annuity must be determined. Factors are not provided for the certain period, and must be developed. Note that the segment 1 interest rate is used for the first 5 years of the certain period and the segment 2 interest rate is used for the final 15 years of the certain period.

$\ddot{a}^{(12)}_{\overline{5}|5\%} = 4.4459$ and $\ddot{a}^{(12)}_{\overline{15}|6\%} = 10.0251$

$$\text{Life with 20 year certain annuity} = \ddot{a}^{(12)}_{\overline{5}|5\%} + \ddot{a}^{(12)}_{\overline{15}|6\%}\, v^{5}_{6\%} + \frac{N^{(12)}_{85@7\%}}{D_{65@7\%}}$$

$$= 4.4459 + (10.0251 \times 0.7473) + \frac{6{,}608}{11{,}394} = 12.5176$$

The funding target is equal to the present value of the benefit accrued as of the valuation date (first day of the year).

Funding target using plan normal form = \$3,200 × 12 × 12.5176 = \$480,676
Funding target using elected life annuity = \$4,000 × 12 × 10.8574 = \$521,155

\$X = \$521,155 – \$480,676 = \$40,479

Answer is C.

Question 43

The amendment increases future benefit accruals only, not past service accruals. However, the entry age normal cost method is a projected benefit method. The accrued liability is a function of the projected benefit, which increases under the terms of the plan amendment. The accrued liability will increase under the plan amendment. The statement is false.

Answer is B.

Note: The only cost method for which the accrued liability will not increase is the unit credit method, because that is the only method that is not a projected benefit method. Rather, unit credit bases the accrued liability on the benefit accrued as of the first day of the year, which is unaffected by the plan amendment in this question.

Question 44

IRC section 430(j)(2) provides that contributions made on a date other than the valuation date are adjusted for interest using the plan effective rate from the date paid to the valuation date. IRC section 430(j)(3)(A) states that when a quarterly contribution is made late, the interest adjustment from the date paid to the quarterly due date is equal to the plan effective rate plus 5 percentage points.

The plan effective rate in this question is 6%, and the quarterly installment that was due on 4/15/2017 but not paid until 6/30/2017 must be discounted for that period using an interest rate of 11% (6% + 5%).

The value of the 4/15/2017 quarterly installment as of 1/1/2017:

If installment paid on time = \$440,000 × $v_{6\%}^{3.5/12}$ = \$432,585

If installment paid late (on 6/30/2017) = \$440,000 × $v_{6\%}^{3.5/12} \times v_{11\%}^{2.5/12}$ = \$423,282

The increase in the contribution required on 9/15/2018 if the 4/15/2017 quarterly installment is paid on 6/30/2017 is:

\$X = (\$432,585 – \$423,282) × $1.06^{20.5/12}$ = \$10,277

Answer is C.

Question 45

The experience gain or loss with regard to Smith's death is equal to the difference between the actual liability and the expected liability. The actual liability is the amount of the death benefit, which is $30,000. The expected liability is equal to the accrued liability under the cost method (the method is not given – however, Smith has reached retirement age as of 1/1/2017 and is fully accrued, so the method is irrelevant).

Accrued benefit as of 1/1/2017 = $83.33 × 12 years of service = $999.96

The expected liability is equal to the death benefit multiplied by the probability of death while age 64, plus the present value of the $999.96 monthly accrued benefit payable beginning on 1/1/2017, multiplied by the probability of surviving from age 64 to age 65. It is given that the probability of death at age 64 is equal to 0.004, so the probability of surviving from age 64 to age 65 is equal to 0.996.

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

$$\text{Expected liability} = (\$30{,}000 \times 0.004) + \left(\$996.96 \times 12 \times \frac{N_{65}^{(12}}{D_{65}} \times 0.996\right)$$

$$= (\$30{,}000 \times 0.004) + \left(\$996.96 \times 12 \times \frac{459{,}331}{38{,}844} \times 0.996\right)$$

$$= \$141{,}447$$

2016 gain = $X = $141,447 – $30,000 = $111,447

Answer is C.

Note: The method of dealing with the pre-retirement death benefit for single employer plans (the special pro-rating method) does not apply to multiemployer plans. The accrued liability with regard to the death benefit is determined under the actuarial cost method being used.

Question 46

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 each of the two prior year 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 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 assumed rate of return is larger than the segment 3 interest rate, then that segment 3 interest rate is used. In this question, the segment 3 rate for 2015 of 5% is used to determine the expected earnings for that year (the assumed rate of return of 7% is larger). The segment 3 rate for 2016 of 6% is used to determine the expected earnings for that year (the assumed rate of return of 7% is larger).

The expected earnings for 2015 are:

$(53{,}800 \times .05) + (2{,}000 \times [1.05^{3.5/12} - 1]) - ([2{,}300 + 200] \times [1.05^{6/12} - 1]) = 2{,}657$

The expected earnings for 2016 are:

$(66{,}200 \times .06) + (2{,}000 \times [1.06^{3.5/12} - 1]) - ([2{,}400 + 200] \times [1.06^{6/12} - 1]) = 3{,}929$

Note that the benefit payments and administrative expenses occurred on 7/1, so there is ½ of a year of expected earnings associated with those transactions. The contribution is deposited 8½ months into the plan year, so it gets 3½ months of assumed interest.

1/1/2015 adjusted fair market value (adjusted to 1/1/2017)
= 53,800 + (2,000 + 2,000) – (2,300 + 2,400) – (200 + 200) + (2,657 + 3,929) = 59,286

1/1/2016 adjusted fair market value (adjusted to 1/1/2017)
= 66,200 + 2,000 – 2,400 – 200 + 3,929 = 69,529

1/1/2017 average value = (78,600 + 69,529+ 59,286)/3 = 69,138

Under IRC section 430(g)(3)(B)(iii), the actuarial value cannot be less than 90% of the market value of the assets. 90% of $78,600 is equal to $70,740.

The 1/1/2017 actuarial value of assets is equal to $70,740.

Answer is D.

Question 47

The 5-year extension of the amortization period for bases existing prior to 1/1/2017 requires a reamortization of the outstanding balance of the bases as of 1/1/2017, with an additional 5 years added to the remaining period. Note that the 2016 actuarial loss of \$800,000 is established on 1/1/2017, so it is ignored for purposes of this question. In addition, the extension only applies to charge bases, so the given actuarial gain base from the 1/1/2016 valuation can be ignored as well.

The outstanding balance of the two remaining bases that are affected by the amortization period extension must be determined as of 1/1/2017. The outstanding balance of those bases as of 1/1/2016 can be amortized over the remaining period as of 1/1/2016, and then multiplied by the annuity due factor for one fewer year to obtain the outstanding balance as of 1/1/2017.

<u>Combined charge base</u>

Amortization as of 1/1/2016 = $\dfrac{\$700{,}000}{\ddot{a}_{\overline{9}|}}$ = \$100,412

Outstanding balance as of 1/1/2017 = \$100,412 × $\ddot{a}_{\overline{8}|}$ = \$641,561

New amortization as of 1/1/2017 = $\dfrac{\$641{,}561}{\ddot{a}_{\overline{13}|}}$ = \$71,741

<u>Actuarial Loss</u>

Amortization as of 1/1/2016 = $\dfrac{\$120{,}000}{\ddot{a}_{\overline{15}|}}$ = \$12,313

Outstanding balance as of 1/1/2017 = \$12,313 × $\ddot{a}_{\overline{14}|}$ = \$115,221

New amortization as of 1/1/2017 = $\dfrac{\$115{,}221}{\ddot{a}_{\overline{19}|}}$ = \$10,419

Decrease in minimum required contribution as of 12/31/2017:

[(\$100,412 - \$71,741) + (\$12,313 - \$10,419)] × 1.07 = \$32,705

Answer is C.

Question 48

IRC section 4971(b) allows for an additional tax of 100% of the unpaid minimum required contribution to be assessed. The statement is true.

Answer is A.

Question 49

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

Smith has retired at age 60 with 25 years of service. The annual accrued benefit, payable at age 65 is:

$50 × 12 × 25 years of service = $15,000

This benefit is reduced by 2% for each of the two years that Smith has retired prior to attaining age 62 (for a total reduction of 4%). Note that there is no reduction for the years prior to age 65 and after age 62.

Early retirement benefit = $15,000 × 0.96 = $14,400

The actual liability is equal to the present value of the early retirement benefit payable immediately at age 60. The commutation functions used are found in the tables of supplementary factors provided with the examination, for a <u>male</u> participant using 6% interest.

$$\text{Actual liability} = \$14{,}400 \times \ddot{a}_{60}^{(12)} = \$14{,}400 \times \frac{N_{60}^{(12)}}{D_{60}} = \$14{,}400 \times \frac{353{,}283}{28{,}999} = \$175{,}429$$

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 62 for 25% of the participants, and 65 for the remaining 75% of the participants, and there are no assumed pre-retirement decrements (a general condition of the exam). The accrued benefit for Smith as of 1/1/2017 is $15,000, unreduced both at age 62 and at age 65. The accrued liability is equal to the present value of the payments expected to be made beginning at age 62 (with a 25% probability) plus the present value of the payments expected to be made beginning at age 65 (with a 75% probability).

$$\text{Expected liability} = \$15{,}000 \times [(\ddot{a}_{62}^{(12)} \times v^2 \times 0.25) + (\ddot{a}_{65}^{(12)} \times v^5 \times 0.75)$$

$$= \$15{,}000 \times [(\frac{N_{62}^{(12)}}{D_{62}} \times 0.889996 \times 0.25) + (\frac{N_{65}^{(12)}}{D_{65}} \times 0.747258 \times 0.75)]$$

$$= \$15{,}000 \times [(\frac{298{,}636}{25{,}547} \times 0.889996 \times 0.25)$$

$$+ (\frac{228{,}812}{20{,}977} \times 0.747258 \times 0.75)]$$

$$= \$130{,}712$$

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

$X = $175,429 – $130,712 = $44,717

Answer is C.

Question 50

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 for 2017.

Cushion amount = (50% × 7,500,000) + (9,250,000 – 7,500,000) = 5,500,000

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

350,000 + 7,500,000 + 5,500,000 – 12,750,000 = 600,000

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:

500,000 + 13,000,000 – 12,750,000 = 750,000

The deductible limit is the larger of the IRC section 404(o)(2)(A) and 404(o)(2)(B) limits, which is 750,000.

Answer is B.

Note: Without regulations for IRC section 404(o), it is unclear as to whether the deductible limit is determined as of the valuation date, or as of the close of the employer's fiscal year (which has traditionally been when the deductible limit is determined). In this question, if 750,000 is increased using the 5.0% effective interest rate to 12/31/2017, the result is 787,500. This is in the same answer range. Also note that it is given that there have always been more than 500 participants. The cushion amount is adjusted in certain cases for HCEs if the plan has no more than 100 participants, and that exception does not apply to this question

Question 51

Treasury regulation 1.430(f)-1(f)(2)(iii) requires that an election to reduce funding balances must be made no later than the end of the plan year for which the election will apply. For the 2017 plan year, that means that the election must be made no later than 12/31/2017. The statement is true.

Answer is A.

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