Association of Accounting Technicians of Sri Lanka

January 2016 Examination - AA1 Level

Questions and Suggested Answers
Subject No : AA12

QUANTITATIVE METHODS FOR BUSINESS (QMB)

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THE ASSOCIATION OF ACCOUNTING TECHNICIANS OF SRI LANKA

EDUCATION AND TRAINING DIVISION

AA1 Examination - January 2016
(12) Quantitative Methods for Business

SUGGESTED ANSWERS

SECTION – A

Objective Test Questions (OTQs)
Sixteen (16) compulsory questions
(Total 40 Marks)

Suggested Answers to Question One:

1.1 **Correct Answer is** (4)

1.2 7% of simple annual interest rate in the question shuld be 7% of compound annual interest rate.

Beginning of the 1 year	Beginning of the 2 year	Beginning of the 3 year	Beginning of the ..... year	Beginning of the 10 year	The end of the 10th year
15000	15000	15000	.....	15000	

$$S = \frac{AR(R^n - 1)}{R - 1}$$

By substituting ; $A = 15000$; $r^0 = 7\% = 0.07$; $R = 1 + r = 1 + 0.07 = 1.07$; and $n = 0$

$$S = \frac{15000 \times 1.07 \times [(1.07)^{10} - 1]}{0.07}$$

Rs. 221,754/-

∴ **Correct Answer is** (2)

1.3 By using the furmula;

$$r = \frac{n\Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{[n\Sigma x^2 - (\Sigma x)^2][n\Sigma y^2 - (\Sigma y)^2]}}$$

$$= \frac{5(1159.7) - (311)(18.6)}{\sqrt{[5(19359) - (311)^2][5(69.82) - (18.6)^2]}}$$

$r = 13.59 / 15.2434$

$r = 0.9119$

∴ **Correct Answer is** (1)

Alternative Method : By using the calculator

1.4 The expected interest rate $= \Sigma x \times P_{(X = x)}$

$= (7.5 \times 0.10)(7.80 \times 0.22) + (8 \times 0.26)(8.6 \times 0.20) + (8.8 \times 0.15) + (9.5 \times 0.07)$

$= 8.251\%$

$= 8.25$ (to 2 d.p.)

∴ **Correct Answer is** (4)

1.5 The coefficient of variation $CV = S / \bar{x}$

When $\bar{x} = \Sigma x / n = 50 / 4 = 12.5$ and

$$S = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n}}$$

$= \sqrt{125 / 5}$

$= \sqrt{25}$

$= 5$

$CV = 5 / 12.5 = 0.4$

∴ **Correct Answer is** (3)

1.6 Free hand method and least square method

∴ **Correct Answer is** (4)

1.7 The weighted average price relative $= \frac{\Sigma(p_1 / p_0)\, w}{\Sigma w}$

$$= \frac{(120 \times 16) + (80 \times 25) + (160 \times 15) + (75 \times 12) + (220 \times 20)}{(16 + 25 + 15 + 12 + 20)}$$

$= 11620 / 88$

$= 132.045$

$= 132.04$ (to 2 d.p.)

∴ **Correct Answer is** (2)

1.8 P → V ; Q → U ; R → T

∴ **Correct Answer is** (2)

1.9 **False** (There is a strong positive correlation between two variables)

1.10 **True** (The cost of repair is increasing with time)

1.11 **False** (y-intercept of the regression line cannot be -200)

1.12 **True**

1.13 **False**

1.14 Probability of the vehicle been recalled = 0.03

$$\frac{\text{Number of vehicles recalled}}{\text{Total number of vehicles}} = 0.03$$

$$\frac{6 + 11 + x}{600} = 0.03$$

$$17 + x = 18$$

$$\underline{\underline{x = 1}}$$

1.15 $6 + 11 + 1 + 194 + y + 197 = 600$

$$y = 600 - 409$$

$$\underline{\underline{y = 191}}$$

1.16

$$P(\text{recalled} \mid \text{Prius}) = \frac{P(\text{recalled} \cap \text{Prius})}{P(\text{Prius})}$$

$$= \frac{6 / 600}{(6 + 11 + 1) / 600}$$

$$= 6 / 18$$

$$= 1/3$$

$$= \underline{\underline{0.33}}$$

End of Section A

SECTION –B

All four (04) questions of this section to be answered.

(32 Marks)

Suggested Answers to Question Two:

(a) $18 + 21 + x + 30 + 24 + 20 + 14 = 150$

$x = 150 - 127$

$x = 23$

Life Span (hours)	No. of bulbs (f)	Mid point (x)	$U = \frac{x - A}{C}$	fU	fU^2
501-600	18	550.5	-300	-5400	1,620,000
601-700	21	650.5	-200	-4200	840,000
701-800	23	750.5	-100	-2300	230,000
801-900	30	850.5 **A**	0	0	0
901-1000	24	950.5	+100	2400	240,000
1001-1100	20	1050.5	+200	4000	800,000
1101-1200	14	1150.5	+300	4200	1,260,000
		$\Sigma f = 150$		**(1300)**	**4,990,000**

Mean, $\bar{x} = A + \left[\frac{\Sigma fU}{\Sigma f}\right] \times C$

$= 850.5 + (-13 / 150) \times 100$

$\bar{x} =$ **841.83** (to 2 d.p.)

Standard deviation, $S = C \times \sqrt{\left[\frac{\Sigma fU^2}{\Sigma f} - \left(\frac{\Sigma fU}{\Sigma f}\right)^2\right]}$

$S = 100 \times \sqrt{(499 / 150) - (-13 / 150)^2}$

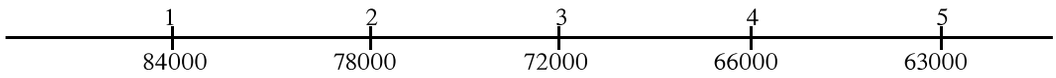
$=$ **182.19** (to 2 d.p.)

Between Mean & Variance $= (4,990,000 / 150) - (-1300 / 150)^2$

$=$ **33,191.56**

(b) ***Method I***

Option 1 : Personal Loan



Let net present value of the 1st option be NPV_1.

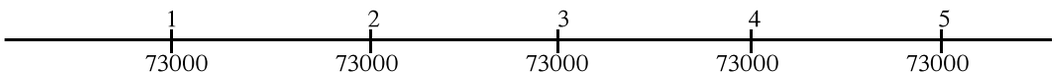
Then;

NPV_1 = 84000 × 0.943 + 78000 × 0.890 + 72000 × 0.840 + 66000 × 0.792 + 63000 × 0.747

(From table we have to obtain discount factors)

NPV_1 = Rs. 308,445/-

Option 2 : Mortage Loan



Let net present value of the option 2 is NPV_2.

NPV_2 = 73000 × Cum DCF (5, 6%)

(Can obtain from the tables)

NPV_2 = 73000 × 4.212

= **Rs. 307,476/-**

$NPV_2 < NPV_1$

∴ the 2nd option is the most suitable option to Perera.

Method II

Year	1	2	3	4	5
Personal Loan - Option I					
Capital	60,000	60,000	60,000	60,000	60,000
Interest	24,000	18,000	12,000	6,000	3,000
	84,000	78,000	72,000	66,000	63,000
	0.943	0.890	0.840	0.792	0.747
308,445	79,212	69,420	60,480	52,272	47,061
Option II					
Mortgage Loan - Repayment	73,000	73,000	73,000	73,000	73,000
	0.943	0.890	0.840	0.792	0.747
307,476	68,839	64,970	61,320	57,816	54,531

∴ **Most suitable option : Option 2**

Suggested Answers to Question Three:

(a) ***Method I***

Cost function, $C(x) = 75000 + 100x - 0.03x^2 + 0.000004x^3$

$\therefore$ Marginal Cost function, $MC = \frac{d}{dx}[C_{(x)}]$

$MC = 100 - 0.03(2x) + 0.000004\ (3x^2)$

$= 100 - 0.06x + 0.000012x^2$

Demand function, $P(x) = 200 - 0.005x$

$\therefore$ Revenue function $R(x) = 200x - 0.005x^2$ [$\therefore R(x) = P(x) \times x$]

$\therefore$ Marginal revenue function, $MR = \frac{d}{dx}[R(x)]$

$MR = 200 - 0.005(2x)$

$MR = 200 - 0.01x$

Profit function = Revenue function - Cost function $\rightarrow$ $P(x) = R(x) - C(x)$

$P(x) = (200x - 0.005x^2) - (75000 + 100x - 0.03x^2 + 0.000004x^3)$

$= 200x - 0.005x^2 - 75000 - 100x + 0.03x^2 - 0.000004x^3$

$P(x) = -0.000004x^3 + 0.025x^2 + 100x - 75000$

Marginal profit function $MP = \frac{d}{dx}[P(x)]$

$= -0.000004(3x^2) + 0.025(2x) + 100(1)$

$= -000012x^2 + 0.05x + 100$

Method II

Revenue (Rx) and Profit (Px) functions;

$R(x) = x(200 - 0.005x) = 200x - 0.005x^2$ .....(1)

$P(x) = 200x - 0.005x^2 - (75{,}000 + 100x - 0.03x^2 + 0.000004x^3)$

$= -75{,}000 + 100x + 0.025x^2 - 0.000004x^3$ .....(2)

Marginal functions are;

$C'(x) = 100 \quad 0.06x \mid 0.000012x^2$

$R'(x) = 200 - 0.01x$

$P'(x) = 100 + 0.05x - 0.000012x^2$

(b) Let the unit price of product A is x and the unit price of product B is y

Then,

$5x + 8y = 350$ ..... (1)

$x = y + 5$ ..... (2)

By substituting (2) in (1);

$5(y + 5) + 8y = 350$

$5y + 25 + 8y = 350$

$13y = 325$

$P_y = Rs.\ 25$

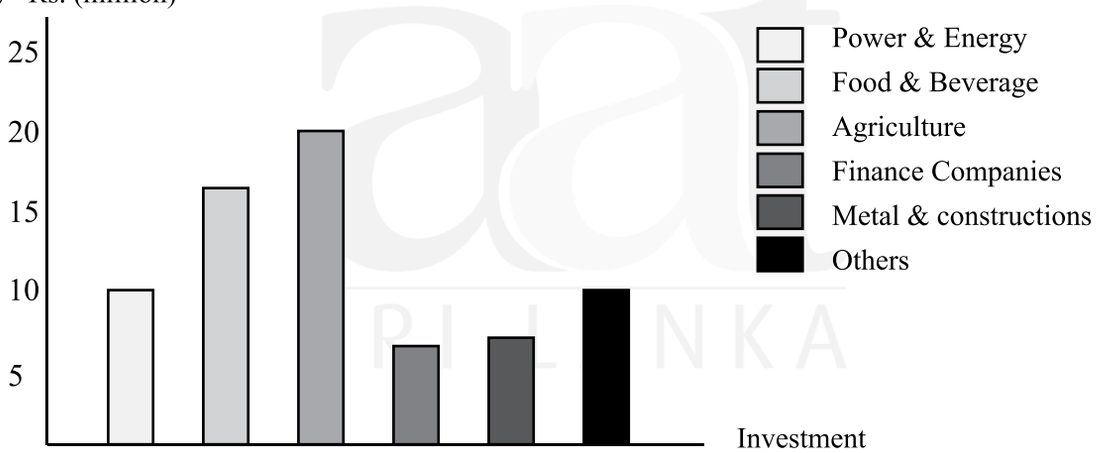
From 2;

$P_x = 25 + 5$

$= Rs.\ 30$

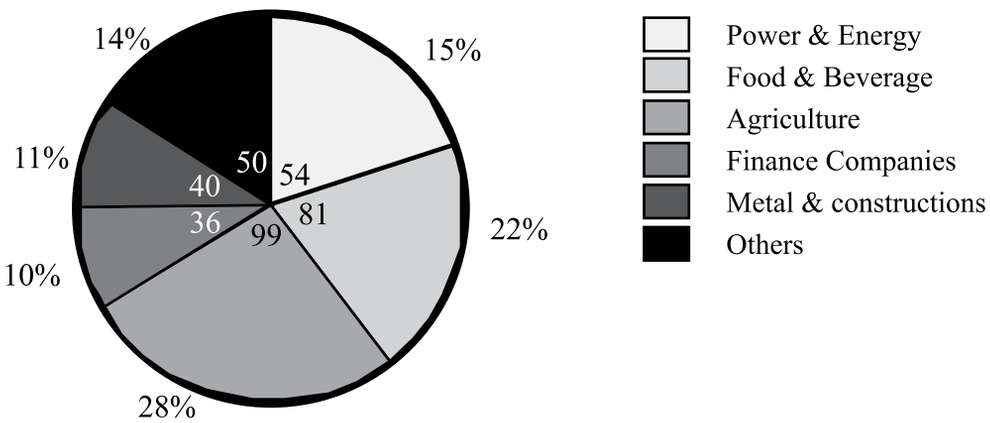
Suggested Answers to Question Four:

(a) Rs. (million)

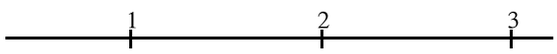


(b)

Type of the Investment	Rs. (million)	Degrees	Percentages
Power & Energy	12	54^0	15%
Food & Beverage	18	81^0	22.5%
Agriculture	22	99^0	27.5%
Finance Companies	8	36^0	10%
Metal & constructions	9	$40.5 = 40^0$ (rounded down)	11.25%
Others	11	$49.5 = 50^0$ (rounded up)	13.75%
Total	**80**	**36^0**	**100%**



(b) I = Rs. 10,000



(i) Maturity value according to scheme, A $= P(1 + nr)$

$= 10,000 (1 + 3 \times 0.05)$

$=$ **Rs. 11,500**

(ii) Total interest receivable according to Scheme B $= P (1 + r)^n - 10,000$

$= 10,000 (1 + 0.05)^3 - 10,000$

$= 11,576.25 - 10,000$

$=$ **Rs. 1,576.25**

(iii) Effective rate of interests, ERI $= (1 + r/f)^f - 1$

$= (1 + 0.05/2)^2 - 1$

$= (1.025)^2 - 1$

$= 0.0506$

$=$ **5.06%**

Suggested Answers to Question Five:

Year	**Quarter**				
	Q1	**Q2**	**Q3**	**Q4**	
2010	**-**	**-**	0.99	1.25	
2011	0.86	0.88	1.02	1.03	
2012	1.00	0.93	1.00	1.13	
2013	0.93	0.92	1.05	1.10	
2014	0.92	0.96	**-**	**-**	
Totals	**3.71**	**3.69**	**4.06**	**4.51**	
Averages	0.9275	0.9225	1.015	1.1275	**3.9925**
	$\frac{0.9275}{3.9925} \times 4$ 0.9292	$\frac{0.9225}{3.9925} \times 4$ 0.9242	$\frac{1.015}{3.9925} \times 4$ 1.0169	$\frac{1.1275}{3.9925} \times 4$ 1.1296	3.9999 ≃ 4
Seasonal Indices	93%	92%	102%	113%	400%

End of Section B

SECTION –C

One (01) question of this section to be answered.
(28 Marks)

Suggested Answers to Question Six:

(a)

	Price per Unit		Sales		P_1q_0	P_0q_0
Item	**2014**	**2015**	**2014**	**2015**		
Cement	850	1150	1100	980	1,265,000	935,000
Steel	600	610	500	500	305,000	300,000
Tiles	450	350	1400	1650	490,000	630,000
					2,060,000	**1,865,000**

Weighted aggregate price index $= \frac{\Sigma P_1q_0}{\Sigma P_0q_0} \times 100$

$= \frac{2,060,000}{1,865,000} \times 100$

$= 110.46\% \ \underline{\Omega} \ 110.45\%$

(b)

Time	Cash Flow	Discounted Cash Flows (10%)	Discounted Cash Flows (20%)
Period 0	-50,000.00	-50,000.00	-50,000.00
Period 1	15,000.00	13,636.36	12,500.00
Period 2	20,000.00	16,528.93	13,888.89
Period 3	25,000.00	18,782.87	14,467.59
Period 4	18,000.00	12,294.24	8,680.56
Net Present Value		**11,242.40**	**-462.96**

The table is part of the first table and we can see that a 10% discount rate gives a positive NPV and a 20% gives a negative NPV. We can therefore use the formula above and calculate IRR as;

$$IRR = \frac{N_2r_1 - N_1r_2}{N_2 - N_1}$$

$$= \frac{-474 \times 15 - 4916 \times 20}{-474 - 4916}$$

$$= \frac{-105430}{-5390}$$

$$= 19.56\%$$

(c) (i) Fixed Costs, FC = 120,000 + 175,000 + 500,000 + 105,000

= Rs. 900,000

Variable Costs, VC = $10000Q + 1000Q^2$

$\therefore$ Total Cost, TC = VC + FC

$\therefore$ TC = $1000Q^2 + 10000Q + 900,000$

(ii)

Total revenue, TR = Unit selling price × No. of units

TR = $(-1000Q + 120,000) \times Q$

= $-1000Q^2 + 120,000Q$

At break even points, TC = TR

$1000Q^2 + 10000Q + 900,000 = -1000Q^2 + 120000Q$

$2000Q^2 - 110,000Q + 900,000 = 0$

$\div 2000$, $Q^2 - 55Q + 450 = 0$

$(Q - 10)(Q - 45) = 0$

$Q = 10$ හෝ $Q = 45$

$\therefore$ Monthly break even quantities are 10 and 45

(iii) Profit P = TR - TC

P = $(-1000Q^2 + 120000Q) - (1000Q^2 + 10000Q + 900,000)$

P = $-2000Q^2 + 110000Q - 900,000$

$dP / dQ = -2000(2Q) + 110000 \times 1 - 0$

$= -4000Q + 110000$

When $dP / dQ = 0$;

$-4000Q + 110000 = 0$

$110000 = 4000Q$

$Q = 27.5$

$d^2P / dQ^2 = -4000 \times 1 + 0 = -4000$

At Q = 27.5

$d^2P / dQ^2 = -4000 < 0$

$\therefore$ Q = 27.5 is a maximum

$\therefore$ Profit maximizing quantity = 28 (to the nearest whole number)

Profit maximizing price, P = -1000 (27.5) + 120000

= Rs. 92,500

End of Section C

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