COST ACCOUNTING AND QUANTITATIVE ANALYSIS

Foundation stage
December 2000

MARKING SCHEME

Question 1

(a) **Cost Accounts for the month of April** **Marks**

Raw Materials

CLC	142,000	Work in Progress (WIP)	168,000
CLC	152,000	Factory o/h	25,000
		Bal c/d	101,000
	294,000		294,000

1

Work in Progress

CLC	185,000	Finished Goods	306,000
Raw Materials	168,000	Bal c/d	198,480
Wages	87,000		
Overheads	64,480		
	504,480		504,480

1½

Finished Goods

CLC	94,000	Cost of Sales (COS)	295,000
WIP	306,000	Bal c/d	105,000
	400,000		400,000

1

Wages

CLC	170,700	WIP	87,000
		Overheads	6,700
		Overheads	28,000
		Administration	18,000
		Selling & Distribution	31,000
	170,700		170,700

1½

Cost Ledger Control

Sales	380,000	O/balances	421,000
Bal c/d	404,480	Raw materials	152,000
		Wages	170,700
		Overheads	6,000
		Overheads	600
		Administration	12,000
		Selling and Distribution	9,000
		Profit	13,180
	784,480		784,480

1½

Factory Overheads

Materials	25,000	WIP	64,480
Wages	6,700	Profit and Loss (P&L)	1,820
Wages	28,000	[Underabsorbed o/h]	
CLC	6,000		
CLC	600		
	66,300		66,300

2

Full credit should be given to students who assume that the overtime payment is 'job specific' and hence the £6,700 is charged to WIP rather than factory overheads

Administration

Wages	18,000	P&L	30,000
CLC	12,000		
	30,000		30,000

½

Selling & Distribution

Wages	31,000	P&L	40,000
CLC	9,000		
	40,000		40,000

½

Cost of Sales

Finished Goods	295,000	P&L	295,000

½

Sales

P&L	380,000	CLC	380,000

½

Profit & Loss

COS	295,000	Sales	380,000
Factory Overheads (Under absorbed)	1,820		
Administration	30,000		
Selling & Distribution	40,000		
Profit [CLC]	13,180		
	380,000		380,000

1½

(12)

(b) An integrated cost accounting system is one where the cost and financial accounts are combined. *1*

Integrated accounting systems thus have the full range of financial accounts including debtors, creditors, bank, prepayments. Interlocking accounting systems have one control account instead of these separate accounts. *1*

Advantages of integrated accounting systems include ease of production of financial accounts, and less time and cost in the production of cost accounts. Financial and cost accounts are consistent with each other. *1½*

Advantages of the interlocking accounting system consist largely of the ability to adopt different approaches to, for instance, stock valuation, depreciation calculation, writing off of obsolete goods. This enables the production of costing information which is more relevant to decisions which need to be taken. *1½*

(5)

(c) Over and under-absorption of overheads

Actual overhead incurred:	£66,300
Actual overhead absorbed:	£64,480
Under absorbed:	£1,820

Reasons:

1.	Actual cost more than budget (£66,300 - £65,000):	£1,300 adverse
2.	Actual hrs worked are less than budget (12,500hrs – 12,400hrs) x £5.20/hr	£520 adverse
		£1,820 *(4)*

(d) Characteristics of normal distribution:

- It is a continuous distribution.
- It is a perfectly symmetrical bell shaped curve.
- The "tails" of the distribution continually approach, but never touch, the horizontal axis.
- The mean, mode and median pass through the peak of the curve and precisely bisect the area under the curve into two equal halves.
- The distribution is fully defined by the mean and standard deviation.

1 mark for each point, to a maximum of 4 marks
(4)

(25)

Question 2

(a) **Variance calculations**

Materials Price variances AQ x (SP – AP)

Mild steel	102,000 kg x (£2.00 - £2.20)	= £20,400 (A)
Plastic	10,200 kg x (£0.50 - £0.45)	= £510 (F)
Screws	245,000 x (£0.02 - £0.015)	= £1,225 (F)

Materials Usage variances (SQ – AQ) x SP

Mild steel	(4,900 x 20 kg – 102,000 kg) x £2	= £8,000 (A)
Plastic	(4,900 x 2 kg - 10,200 kg) x £0.50	= £ 200 (A)
Screws	(245,000 - 245,000) x £0.02	= NIL

Materials Cost variances (SC - AC)

Mild steel	= £28,400 (A)
Plastic	= £310 (F)
Screws	= £1,225 (F)

Labour Rate variances AH x (SR - AR)

Assembly section	19,700 hours x (£25 - £26.20)	= £23,640 (A)
Finishing section	9,900 hours x (£15 - £15.50)	= £4,950 (A)

Labour Efficiency variances (SH - AH) x SR

Assembly section	(4,900 x 4 – 19,700) hrs x £25	= £2,500 (A)
Finishing section	(4,900 x 2 - 9,900) hrs x £15	= £1,500 (A)

Labour Cost variances (SC – AC)

Assembly section	= £26,140 (A)
Finishing section	= £6,450 (A)

1 mark for each variance
(15)

(b) **Consistency of comments**

Materials price variances (bulk buying therefore cheaper prices)

NOT consistent for Mild steel	(Adverse variance)
But CONSISTENT for Plastic	(Favourable variance)
And CONSISTENT for Screws	(Favourable variance)

Materials usage variances (lower losses of materials)

NOT consistent for Mild Steel	(Adverse variance)
NOT consistent for Plastic	(Adverse variance)
NOT consistent for Screws	(Nil variance)

Labour rate variances (paying higher overtime rates)

CONSISTENT for Assembly section	(Adverse variance)
CONSISTENT for Finishing section	(Adverse variance)

Labour efficiency variances (excellent efficiency)

NOT consistent for Assembly section	(Adverse variance)
NOT consistent for Finishing section	(Adverse variance)

½ mark for each comment
(5)

(c) Normal distribution

(i) Proportion less than 8.9cm:

$$Z = \frac{m - x}{s} = \frac{9.5 - 8.9}{1.5} = \frac{0.6}{1.5} = 0.4$$

from the normal distribution table, the proportion > 0.4 is 34.46%. By symmetry, the proportion less than 8.9cm is thus 34.46%. *2½*

(ii) Proportion between 8.5cm and 10.5 cm:

$$Z = \frac{m - x}{s} = \frac{9.5 - 8.5}{1.5} = \frac{1}{1.5} = 0.67$$

from the normal distribution table, the proportion > 0.67 is 25.14%. Therefore, the proportion between 8.5cm and 10.5cm is 100 – 25.14 – 25.14 = 49.72% *2½*

(5)

(25)

Question 3

(a)

Cost Item	Appt Base	Manuf. £	Fin. £	Stores £	Maint. £	Total £
Indirect labour	Allocate	200,000	400,000	70,000	70,000	740,000
Personnel/Admin/ Finance	Staff Nos.	60,000	100,000	20,000	20,000	200,000
Rates Rent Utilities	Area	35,750	11,375	8,125	9,750	65,000
Canteen	Staff Nos.	4,500	7,500	1,500	1,500	15,000
Insurance/depn.	Machine Val	16,000	3,000	1,000	-	20,000
		316,250	521,875	100,625	101,250	1,040,000

Apportionment %s:				
Stores (using %s given)	60%	25%	-	15%
Maintenance (using value of machines)	80%	15%	5%	-

Reapportion Service Depts:

S	=	100,625 + 0.05M
M	=	101,250 + 0.15S
S	=	100,625 + 0.05 (101,250 + 0.15S)
S	=	105,687.5 + 0.0075S
0.9925S	=	105,687.5
S	=	106,486
M	=	117,223

		Manuf. £	Fin. £	Stores £	Maint. £
		316,250	521,875	100,625	101,250
Stores	% work	63,892	26,621	(106,486)	15,973
Maintenance	Mach. Val.	93,778	17,584	5,861	(117,223)
		473,920	566,080	-	-

Continuous allocation method is also acceptable if figures within a few pounds of the above answer.

	Manuf.	Fin.
Overhead absorption rates	£473,920	£566,080
	100,000 hrs	35,000 hrs
	£4.7392 machine hr.	£16.1737 labour hr

- Selection of reasonable apportionment bases (½ mark each). *3*
- Application of apportionment bases to arrive at consistent total cost per dept. *4*
- Treatment of reciprocal services using simultaneous equations/continuous allocation. *4*
- Determination of absorption rates. *2*

(13)

(b) Full Cost of "Broadbat"

	Manufacturing	**Finishing**	**Total**	½
Direct Materials			20.00	*2*
Direct Labour	5.50	12.00	17.50	*1*
Overheads	14.22	32.35	46.57	½
Total			84.07	

Direct labour cost

Manufacturing: £110,000 ÷ 20,000 hrs = £5.50 per hr direct labour x 1hrs = £5.50
Finishing: £210,000 ÷ 35,000 hrs = £6.00 per hr direct labour x 2hrs = £12

Overhead cost

Manufacturing: 3 mach hrs x £4.7392 per machine hour = £14.22
Finishing: 2 labour hours x £16.1737 = £32.35

(4)

(c) (i) Statistical Test

	X	$X - \bar{x}$	$(X - \bar{x})^2$
	234	(24)	576
	246	(12)	144
	252	(6)	36
	264	6	36
	270	12	144
	282	24	576
S	1,548		1,512

$\bar{x}$ = 1,548 / 6 = 258 mins *1*

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}} = \sqrt{\frac{1{,}512}{5}} = \sqrt{302.4} = 17.39 \text{ mins}$$ *2*

(3)

(ii) Hypothesis test

H_0 : μ = 240 minutes
H_1 : μ ? 240 minutes *(acceptable to do a one tailed test testing that μ > 240 minutes)* ½

Standard Error = $\frac{s}{\sqrt{n}} = \frac{17.39}{\sqrt{6}} = 7.099$ *1*

t statistic = $\frac{s - \bar{x}}{SE} = \frac{258 - 240}{7.099} = 2.535$ *1*

At the 95% significance level the appropriate statistic to compare the 2.535 with is from the Student's T Distribution (small sample sizes). At n-1 degrees of freedom the appropriate statistics are:

One-tailed test = 2.015

Two-tailed test = 2.571 *½*

Comment:

"For a one tailed test, conclude that the sample data gives 95% confidence that the true mean manufacturing time is not 240 minutes but is actually greater than 240 minutes"

"For a two-tailed test, conclude that the sample data gives 95% confidence that the mean manufacturing time is, as assumed, 240 minutes"

Comment however, that the sample size is very small. *2*
(5)

(25)

Question 4

(a) Forecast

Year	Quarter	Production	4 Qtr Moving Ave	Centred	Actual - centred	Forecast Period	Forecast
1998	Q1	2,849					
	Q2	2,933					
			2,453.75				
	Q3	2,253		2,447.88	-194.88	0	
			2,442.00				
	Q4	1,780		2,435.88	-655.88	1	
			2,429.75				
1999	Q1	2,802		2,424.25	377.75	2	
			2,418.75				
	Q2	2,884		2,412.63	471.38	3	
			2,406.50				
	Q3	2,209		2,400.13	-191.13	4	
			2,393.75				
	Q4	1,731		2,387.88	-656.88	5	
			2,382.00				
2000	Q1	2,751		2,375.88	375.13	6	
	Q2	2,837	2,369.75			7	
	Q3	2,160				8	
	Q4					9	1,684
2001	Q1					10	2,704
	Q2					11	2,787
	Q3					12	2,111
	Q4					13	1,636
Marks			*2*	*2*	*2*		*3*

Average quarterly decrease in production:

From 2,447.88 litres in Q3 of 1998 to 2,375.88 litres in Q1 of 2000. Decrease of 72 litres over 6 quarters = 12 litres per quarter.

2

Average seasonal variation:

	Q1	Q2	Q3	Q4
1998			-194.88	-655.88
1999	377.75	471.38	-191.13	-656.38
2000	375.125			
Average (rounded)	376	471	-193	-656

Therefore, forecast using y = 2447.88 – 12x and adjust seasonally per above table. *3*

NB *The above solution follows the study guide methodology which uses moving averages for establishing the trend line rather than linear regression which is the methodology used in Quantitative Techniques by T. Lucey. The alternative solution using Lucey's methodology is presented below and students should be awarded full marks if their answer matches this. It should be noted however, that the Lucey methodology produces a distorted forecast in this case because of the lack of quarter 4 data in year 2000.*
(14)

ALTERNATIVE ANSWER (per Lucey)

Year	Qtr. X	Prodn. Y	XY	X^2	Estimate	Actual – Estimate (add.)	Actual / Estimate (mult.)
1998	1	2,849	2,849	1	2,609	240	109
	2	2,933	5,866	4	2,582	351	114
	3	2,253	6,759	9	2,554	-301	88
	4	1,780	7,120	16	2,527	-747	70
1999	5	2,802	14,010	25	2,499	303	112
	6	2,884	17,304	36	2,472	412	117
	7	2,209	15,463	49	2,444	-235	90
	8	1,731	13,848	64	2,417	-686	72
2000	9	2,751	24,759	81	2,389	362	115
	10	2,837	28,370	100	2,362	475	120
	11	2,160	23,760	121	2,334	-174	93
S	66	27,189	160,108	506			

Marks *4* *2*

Using linear regression formulae to establish the average trend line:

y = a + bx

y = 2,636.782 – 27.509x *2*

Use this equation to establish estimate column

Two equally valid approaches are acceptable for establishing the seasonal variation from the average trend line – additive or multiplicative:

Average seasonal variation:

Quarter	Additive	Multiplicative
1	301	112
2	413	117
3	-237	90
4	-716	71

3

Forecast:

Year	Quarter	n	Trend	Additive Prediction	Multiplicative Prediction
2000	Q4	12	2,307	1,590	1,639
2001	Q1	13	2,279	2,581	2,556
	Q2	14	2,252	2,665	2,630
	Q3	15	2,224	1,987	2,010
	Q4	16	2,197	1,480	1,560

3

(14)

(b) Difference between qualitative and quantitative data:

Quantitative approach: These are techniques of varying levels of statistical complexity which are based on analysing past data of the item to be forecast, eg sales figures, stores issues, costs incurred. There is an underlying assumption that past patterns will provide some guidance to the future.

1 mark for reasonable description of quantitative approach.

Qualitative approach: Techniques which are used when data are scarce, eg the first introduction of a new product. The techniques use human judgement and experience to turn qualitative information into quantitative estimates. Such techniques require judgement, intuition, experience, flair etc (qualitative factors).

1 mark for reasonable description of qualitative approach.

Possible qualitative techniques (as per Lucey, 1996)

Delphi method: Technique used mainly for longer term forecasting, designed to obtain expert consensus for a particular forecast. A panel of experts independently answers a sequence of questionnaires in which the responses to one questionnaire are used to produce the next questionnaire. Subsequent

judgements are refined as more information and experience become available until the desired degree of consensus is met.

Market research: uses surveys, analyses of market data, questionnaires and other investigations to gauge the reaction of the market to a particular product, design, price etc.

Historical analogy: for a new product, data on similar products are analysed to establish the life cycle and expected sales of the new product.

Up to 2 marks for each description of two forecasting techniques, to a maximum of 4 marks

(6)

(c) **Profit and Loss account for 1999** **Marks**

	Units	**£/unit**	**£**	**£**	
Sales	9,700	10.00	97,000	97,000	*1½*
Variable Cost of Sales					
O/stock	481	3	1,443		
Production	9,626	3	28,878		
C/stock	(407)	3	(1,221)		
Total Variable cost				29,100	*1*
CONTRIBUTION				67,900	*½*
Less Fixed Costs				(50,000)	*½*
Profit for the year				17,900	*½*

Calculation of sales volume

Opening stock	481
Plus production	9,626
Less closing stock	(407)
Total sales	9,700 litres

Plus 1 mark for the correct layout
(5)
(25)

Question 5

Megabite Ltd Answer

(a) **FIFO**

Date	Receipt (kilos)	Price £/kg	Total Value £	Issues (kilos)	Price £/kg	Value of issues £	Stock Balances (kilos)	Price £/kg	Value £
OS	80	20.00	1,600				80		1,600
2.April	100	22.00	2,200				180		3,800
13 April	300	20.00	6,000				480		9,800
14 April				80	20.00	1,600			
				70	22.00	1,540	330		6,660
19 April				30	22.00	660			
				170	20.00	3,400	130		2,600
21 April	120	18.00	2,160				250		4,760
27 April	80	25.00	2,000				330		6,760
28 April				130	20.00	2,600			
				20	18.00	360	180		3,800
						10,160			

4

LIFO

Date	Receipt (kilos)	Price £/kg	Total Value £	Issues (kilos)	Price £/kg	Value of issues £	Stock Balances (kilos)	Price £/kg	Value £
OS	80	20.00	1,600				80		1,600
2 April	100	22.00	2,200				180		3,800
13 April	300	20.00	6,000				480		9,800
14 April				150	20.00	3,000	330		6,800
19 April				150	20.00	3,000			
				50	22.00	1,100	130		2,700
21 April	120	18.00	2,160				250		4,860
27 April	80	25.00	2,000				330		6,860
28 April				80	25.00	2,000			
				70	18.00	1,260	180		3,600
						10,360			

4

Weighted Average

Date	Receipt (kilos)	Price £/kg	Total Value £	Issues (kilos)	Price £/kg	Value of issues £	Stock Balances (kilos	Price £/kg	Value £
OS	80	20.00	1,600				80	20.000	1,600
2 April	100	22.00	2,200				180	21.111	3,800
13 April	300	20.00	6,000				480	20.417	9,800
14 April				150	20.417	3,063	330	20.417	6,737
19 April				200	20.417	4,083	130	20.417	2,654
21 April	120	18.00	2,160				250	19.256	4,814
27 April	80	25.00	2,000				330	20.649	6,814
28 April				150	20.649	3,097	180	20.649	3,717
						10,243			

4

(12)

(b) Alternative methods of pricing stores issues:

Standard cost

A predetermined average or standard cost is calculated at the start of the accounting period of what future purchases should cost with efficient buying.

Replacement cost

Usually materials used then have to be replaced and thus can be argued that relevant material cost will be the replacement cost.

NB HIFO, NIFO and specific price (if explained) are also acceptable.

2 marks for each well described suggestion *(4)*

(c) Debitanium prices

(i) "Expected price"

0.2 x £22	=	£4.4
0.45 x £25	=	£11.25
0.35 x £27	=	£9.45
Expected price	=	£25.10

2

Expected price will not be the actual price paid during the year (that will be either £22, £25, or £27). The expected price is useful for comparing with a range of possible options. *1*

(ii) Rising each month at 0.2%

Year 1: $(1.002)^{12}$ x £20 = £20.49
Year 2: $(1.002)^{12}$ x £20.49 = £20.98
Year 3: $(1.002)^{12}$ x £20.98 = £21.49 *2*

Rising each year at 2.3%

Year 1: 1.023 x £20 = £20.46
Year 2: 1.023 x £20.46 = £20.93
Year 3: 1.023 x £20.93 = £21.41 *2*

Rising with RPI

Year 1: £20 x 118/115 = £20.52
Year 2: £20.52 x 121/118 = £21.04
Year 3: £21.04 x 123/121 = £21.39 *2*

(9)

(25)