Performance Pillar

P2 – Performance Management

Wednesday 2 March 2011

Instructions to candidates

You are allowed three hours to answer this question paper.
You are allowed 20 minutes reading time **before the examination begins** during which you should read the question paper and, if you wish, make annotations on the question paper. However, you will **not** be allowed, **under any circumstances**, to open the answer book and start writing or use your calculator during this reading time.
You are strongly advised to carefully read ALL the question requirements before attempting the question concerned (that is all parts and/or sub-questions).
ALL answers must be written in the answer book. Answers written on the question paper will **not** be submitted for marking.
You should show all workings as marks are available for the method you use.
ALL QUESTIONS ARE COMPULSORY.
Section A comprises 5 questions and is on pages 2 to 5.
Section B comprises 2 questions and is on pages 6 to 9.
Maths tables and formulae are provided on pages 11 to 14.
The list of verbs as published in the syllabus is given for reference on page 15.
Write your candidate number, the paper number and examination subject title in the spaces provided on the front of the answer book. Also write your contact ID and name in the space provided in the right hand margin and seal to close.
Tick the appropriate boxes on the front of the answer book to indicate which questions you have answered.

P2 – Performance Management

TURN OVER

SECTION A – 50 MARKS

[Note: The indicative time for answering this section is 90 minutes.]

ANSWER *ALL* FIVE QUESTIONS IN THIS SECTION. EACH QUESTION IS WORTH 10 MARKS. YOU SHOULD SHOW YOUR WORKINGS AS MARKS ARE AVAILABLE FOR THE METHOD YOU USE.

Question One

The standard direct labour cost of one batch of 100 units of a product is $50.40. This assumes a standard time of 4.2 hours, costing $12 per hour. The standard time of 4.2 direct labour hours is the average time expected per batch based on a product life of 12,800 units or 128 batches. The expected time for the first batch was 20 hours and an 80% learning curve is expected to apply throughout the product's life.

The company has now completed the production of 32 batches of the product and the total actual direct labour cost was $3,493. The following direct labour variances have also been calculated:

Direct labour rate	$85 Adverse
Direct labour efficiency	$891 Adverse

Further analysis has shown that the direct labour efficiency variance was caused solely by the actual rate of learning being different from that expected. However, the time taken for the first batch was 20 hours as expected.

Required:

(a) **Calculate** the actual rate of learning that occurred.

(6 marks)

(b) Assuming that the actual rate of learning and the actual labour rate continue throughout the life of the product, **calculate** the total direct labour cost that the company will incur during the life of the product.

(4 marks)

(Total for Question One = 10 marks)

Question Two

PR currently uses a constant flow production system to manufacture components for the motor industry. The demand from the motor industry is higher in certain months of the year and lower in others. PR holds inventory so that it can supply the components as they are demanded. Increasingly, the costs to PR of holding inventory are having a significant effect on its profits and the management of PR are considering changing the production system to one that operates on a just-in-time (JIT) basis.

Required:

(a) **Explain** the concepts of a JIT production system.

(4 marks)

(b) **Explain** TWO reasons why the profit of PR may NOT increase as a result of changing to a JIT production system.

(6 marks)

(Total for Question Two = 10 marks)

Question Three

A college is preparing its budget for 2012. In previous years the director of the college has prepared the college budget without the participation of senior staff and presented it to the college board for approval.

Last year the college board criticised the director over the lack of participation of his senior staff in the preparation of the budget for 2011 and requested that for the 2012 budget the senior staff were to be involved.

Required:

Discuss the potential advantages and disadvantages to the college of involving the senior staff in the budget preparation process.

(Total for Question Three = 10 marks)

Question Four

KHL manufactures a single product and operates a budgetary control system that reports performance using variances on a monthly basis. The company has an agreement with a local supplier and calls off raw materials as and when required. Consequently there is no inventory of raw materials.

The following details have been extracted from the budget working papers for 2011:

	Annual Activity (units)		
	50,000	*70,000*	*90,000*
	$000	*$000*	*$000*
Sales revenue	3,200	4,480	5,760
Direct materials (3 kgs per unit)	600	840	1,080
Direct labour (2 hours per unit)	1,000	1,400	1,800
Variable overhead (2 hours per unit)	400	560	720
Fixed overhead (2 hours per unit)*	600	600	600

*The fixed overhead absorption rate of $5 per hour was based on an annual budget of 60,000 units of the product being produced at a constant monthly rate throughout the year, with the fixed overhead cost being incurred in equal monthly amounts.

The following actual performance relates to February 2011:

	$	*$*
Sales revenue (5,700 units)		330,600
Direct materials (18,600 kgs)	70,680	
Direct labour (11,500 hours)	128,800	
Variable overhead (11,500 hours)	47,150	
Fixed overhead absorbed	60,000	
	306,630	
Finished goods inventory adjustment	15,000	291,630
Gross profit		38,970
Fixed overhead over-absorption		3,000
Profit		41,970

For February 2011 budgeted sales were 6,000 units, the selling price variance was $34,200 Adverse and the sales volume profit variance was $4,200 Adverse. The actual fixed overhead incurred was $57,000.

Budgeted profit for February 2011 was $84,000.

Required:

Prepare a statement for February 2011 that reconciles the budgeted profit of $84,000 with the actual profit of $41,970.

You should show the variances in as much detail as possible given the data provided.

(Total for Question Four = 10 marks)

Question Five

ZX is a new banking organisation which is about to open its first branches. ZX believes that it needs to offer potential customers a new banking experience if it is to win customers from other banks.

Whereas other banks have focused on interest rates and levels of bank charges, ZX believes that quality and availability of service is an important factor in the choice made by customers.

Required:

Explain how Total Quality Management (TQM) would enable ZX to gain competitive advantage in the banking sector.

(Total for Question Five = 10 marks)

(Total for Section A = 50 marks)

End of Section A

Section B starts on page 6

SECTION B – 50 MARKS

[Note: The indicative time for answering this section is 90 minutes.]

ANSWER *BOTH* QUESTIONS IN THIS SECTION. EACH QUESTION IS WORTH 25 MARKS. YOU SHOULD SHOW YOUR WORKINGS AS MARKS ARE AVAILABLE FOR THE METHOD YOU USE.

Question Six

WZ is a manufacturing company with two factories. The company's West factory currently produces a number of products. Four of these products use differing quantities of the same resources. Details of these four products and their resource requirements are as follows:

Product	*J* *$/unit*	*K* *$/unit*	*L* *$/unit*	*M* *$/unit*
Selling price	56	40	78	96
Direct labour ($8 per hour)	20	16	24	20
Direct material A ($3 per litre)	6	3	0	9
Direct material B ($5 per kg)	10	0	15	20
Variable overhead (see note 1)				
Labour related	1.25	1	1.50	1.25
Machine related	1.25	2	0.75	1
Total variable cost	38.50	22	41.25	51.25
Other data:				
Machine hours per unit	5	8	3	4
Maximum demand per week	1,000	3,500	2,800	4,500

Notes

1. An analysis of the variable overhead shows that some of it is caused by the number of labour hours and the remainder is caused by the number of machine hours.

2. Currently WZ purchases a component P from an external supplier for $35 per component. A single unit of this component is used in producing N the company's only other product. Product N is produced in WZ's other factory and does not use any of the resources identified above. Product N currently yields a positive contribution. WZ could manufacture the component in its West factory, but to do so would require: 1 hour of direct labour, 0.5 machine hours, and 2 kgs of direct material B. WZ purchases 500 components per week. WZ could not produce the component in its other factory.

3. The purchasing director has recently advised you that the availability of direct materials A and B is to be restricted to 21,000 litres and 24,000 kgs per week respectively. This restriction is unlikely to change for at least 10 weeks. No restrictions are expected on any other resources.

4. WZ does not hold inventory of either finished goods or raw materials.

5. WZ has already signed a contract, which must be fulfilled, to deliver the following units of its products each week for the next 10 weeks:

Product	*Contract units*
J	100
K	200
L	150
M	250

These quantities are in addition to the maximum demand identified above.

Required:

(a) **Calculate** whether WZ should continue to purchase the component P or whether it should manufacture it internally during the next 10 weeks.

(11 marks)

(b) **Prepare** a statement to show the optimum weekly usage of the West factory's available resources.

Note: You are NOT required to use linear programming.

(3 marks)

(c)

(i) Assuming no other changes, **calculate** the purchase price of the component P at which your advice in part *(a)* above would change.

(4 marks)

(ii) **Explain** TWO non-financial factors that should be considered before deciding whether or not to manufacture the component internally.

(4 marks)

(d) If you were to solve part *(b)* above using linear programming **state** the following:

- The objective function
- The inequality for the material A constraint
- The inequality for the material B constraint

(3 marks)

(Total for Question Six = 25 marks)

Section B continues on page 8

Question Seven

The PZ Group comprises two companies: P Limited and Z Limited. Both companies manufacture similar items and are located in different regions of the same country. Return on Capital Employed (ROCE) is used as the group's performance measure and is also used to determine divisional managers' bonuses. The results of the two companies and of the group for the year ended 31st December 2010 and the balance sheets at that date are as follows:

	P Limited *$000*	*Z Limited* *$000*	*PZ Group* *$000*
Revenue	200,000	220,000	400,000
Cost of sales	170,000	160,000	310,000
Gross profit	30,000	60,000	90,000
Administration costs	10,000	30,000	40,000
Interest payable	10,000		10,000
Pre-tax profit	10,000	30,000	40,000
Non-current assets:			
Original cost	1,000,000	1,500,000	2,500,000
Accumulated depreciation	590,400	1,106,784	1,697,184
Net book value	409,600	393,216	802,816
Net current assets	50,000	60,000	110,000
	459,600	453,216	912,816
Non-current borrowings	150,000		150,000
Shareholders' funds	309,600	453,216	762,816
Capital employed	459,600	453,216	912,816

Notes

1. During the year Z Limited sold goods to P Limited that had cost Z Limited $10,000. The transactions relating to this sale have been eliminated from the PZ Group results stated above.

2. Both companies use the group depreciation policy of 20% per annum on a reducing balance basis for their non-current assets. Neither company made any additions or disposals of non-current assets during the year.

Required:

(a) **Calculate** the Return on Capital Employed (ROCE) ratios for each of the two companies for the year and **analyse** these into their secondary ratio components of:

(i) Pre-tax profit %
(ii) Asset Turnover

(3 marks)

(b)

(i) **Calculate** Z's gross profit margin on its internal sales and compare this to the gross profit margin on its external sales.

(4 marks)

(ii) **Discuss** the performance of the two companies EXCLUDING the effects of the intra group transactions.

(11 marks)

Due to operational difficulties, the directors of the PZ Group are to impose a transfer pricing policy.

(c) **Explain** THREE factors that they should consider when setting the transfer pricing policy.

(7 marks)

(Total for Question Seven = 25 marks)

(Total for Section B = 50 marks)

End of question paper

Maths tables and formulae are on pages 11 to 14

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PRESENT VALUE TABLE

Present value of 1 unit of currency, that is $(1+r)^{-n}$ where r = interest rate; n = number of periods until payment or receipt.

Periods (n)	Interest rates (r)									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180
19	0.828	0.686	0.570	0.475	0.396	0.331	0.277	0.232	0.194	0.164
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149

Periods (n)	Interest rates (r)									
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694
3	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579
4	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482
5	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402
6	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335
7	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279
8	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233
9	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.225	0.209	0.194
10	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162
11	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135
12	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112
13	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093
14	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078
15	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.079	0.065
16	0.188	0.163	0.141	0.123	0.107	0.093	0.081	0.071	0.062	0.054
17	0.170	0.146	0.125	0.108	0.093	0.080	0.069	0.060	0.052	0.045
18	0.153	0.130	0.111	0.095	0.081	0.069	0.059	0.051	0.044	0.038
19	0.138	0.116	0.098	0.083	0.070	0.060	0.051	0.043	0.037	0.031
20	0.124	0.104	0.087	0.073	0.061	0.051	0.043	0.037	0.031	0.026

Cumulative present value of 1 unit of currency per annum, Receivable or Payable at the end of each year for n years $\frac{1-(1+r)^{-n}}{r}$

Periods (n)	Interest rates (r)									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201
19	17.226	15.679	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365
20	18.046	16.351	14.878	13.590	12.462	11.470	10.594	9.818	9.129	8.514

Periods (n)	Interest rates (r)									
	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327
12	6.492	6.194	5.918	5.660	5.421	5.197	4.988	7.793	4.611	4.439
13	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14	6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675
16	7.379	6.974	6.604	6.265	5.954	5.668	5.405	5.162	4.938	4.730
17	7.549	7.120	6.729	6.373	6.047	5.749	5.475	5.222	4.990	4.775
18	7.702	7.250	6.840	6.467	6.128	5.818	5.534	5.273	5.033	4.812
19	7.839	7.366	6.938	6.550	6.198	5.877	5.584	5.316	5.070	4.843
20	7.963	7.469	7.025	6.623	6.259	5.929	5.628	5.353	5.101	4.870

FORMULAE

PROBABILITY

$A \cup B$ = ***A* or *B***. $A \cap B$ = ***A* and *B*** (overlap).
$P(B \mid A)$ = probability of *B*, **given** *A*.

Rules of Addition
If *A* and *B* are mutually exclusive: $P(A \cup B) = P(A) + P(B)$
If *A* and *B* are not mutually exclusive: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Rules of Multiplication
If *A* and *B* are *independent*:: $P(A \cap B) = P(A) * P(B)$
If *A* and *B* are **not** *independent*: $P(A \cap B) = P(A) * P(B \mid A)$

$E(X) = \sum$ (probability * payoff)

DESCRIPTIVE STATISTICS

Arithmetic Mean

$$\bar{x} = \frac{\sum x}{n} \qquad \bar{x} = \frac{\sum fx}{\sum f} \quad \text{(frequency distribution)}$$

Standard Deviation

$$SD = \sqrt{\frac{\sum (x - \bar{x})^2}{n}} \qquad SD = \sqrt{\frac{\sum fx^2}{\sum f} - \overline{x^2}} \quad \text{(frequency distribution)}$$

INDEX NUMBERS

Price relative = 100 * P_1/P_0 Quantity relative = 100 * Q_1/Q_0

Price: $$\frac{\sum w * \left(\frac{P_1}{P_o}\right)}{\sum w} x\,100$$

Quantity: $$\frac{\sum w * \left(\frac{Q_1}{Q_o}\right)}{\sum w} x\,100$$

TIME SERIES

Additive Model

Series = Trend + Seasonal + Random

Multiplicative Model

Series = Trend * Seasonal * Random

FINANCIAL MATHEMATICS

Compound Interest (Values and Sums)
Future Value *S*, of a sum of *X*, invested for *n* periods, compounded at *r*% interest

$$S = X[1 + r]^n$$

Annuity
Present value of an annuity of £1 per annum receivable or payable for *n* years, commencing in one year, discounted at *r*% per annum:

$$PV = \frac{1}{r}\left[1 - \frac{1}{[1+r]^n}\right]$$

Perpetuity
Present value of £1 per annum, payable or receivable in perpetuity, commencing in one year, discounted at *r*% per annum:

$$PV = \frac{1}{r}$$

LEARNING CURVE

$$Y_x = aX^b$$

where:
Y_x = the cumulative average time per unit to produce X units;
a = the time required to produce the first unit of output;
X = the cumulative number of units;
b = the index of learning.

The exponent b is defined as the log of the learning curve improvement rate divided by log 2.

INVENTORY MANAGEMENT

Economic Order Quantity

$$EOQ = \sqrt{\frac{2C_oD}{C_h}}$$

where: C_o = cost of placing an order
C_h = cost of holding one unit in inventory for one year
D = annual demand

LIST OF VERBS USED IN THE QUESTION REQUIREMENTS

A list of the learning objectives and verbs that appear in the syllabus and in the question requirements for each question in this paper.

It is important that you answer the question according to the definition of the verb.

LEARNING OBJECTIVE	VERBS USED	DEFINITION
Level 1 - KNOWLEDGE		
What you are expected to know.	List	Make a list of
	State	Express, fully or clearly, the details/facts of
	Define	Give the exact meaning of
Level 2 - COMPREHENSION		
What you are expected to understand.	Describe	Communicate the key features
	Distinguish	Highlight the differences between
	Explain	Make clear or intelligible/State the meaning or purpose of
	Identify	Recognise, establish or select after consideration
	Illustrate	Use an example to describe or explain something
Level 3 - APPLICATION		
How you are expected to apply your knowledge.	Apply	Put to practical use
	Calculate	Ascertain or reckon mathematically
	Demonstrate	Prove with certainty or to exhibit by practical means
	Prepare	Make or get ready for use
	Reconcile	Make or prove consistent/compatible
	Solve	Find an answer to
	Tabulate	Arrange in a table
Level 4 - ANALYSIS		
How are you expected to analyse the detail of what you have learned.	Analyse	Examine in detail the structure of
	Categorise	Place into a defined class or division
	Compare and contrast	Show the similarities and/or differences between
	Construct	Build up or compile
	Discuss	Examine in detail by argument
	Interpret	Translate into intelligible or familiar terms
	Prioritise	Place in order of priority or sequence for action
	Produce	Create or bring into existence
Level 5 - EVALUATION		
How are you expected to use your learning to evaluate, make decisions or recommendations.	Advise	Counsel, inform or notify
	Evaluate	Appraise or assess the value of
	Recommend	Advise on a course of action

Performance Pillar

Management Level Paper

P2 – Performance Management

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