



CHARTERED ACCOUNTANTS EXAMINATIONS

PROFESSIONAL LEVEL

P2: ADVANCED MANAGEMENT ACCOUNTING

TUESDAY 15 DECEMBER 2015

TOTAL MARKS – 100; TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS TO CANDIDATES

1. You have fifteen (15) minutes reading time. Use it to study the examination paper carefully so that you understand what to do in each question. You will be told when to start writing.
2. This paper is divided into TWO sections:
Section A: One (1) compulsory question.
Section B: Four (4) Optional questions. Attempt any three (3) questions.
3. Enter your student number and your National Registration Card number on the front of the answer booklet. Your name must **NOT** appear anywhere on your answer booklet.
4. Do **NOT** write in pencil (except for graphs and diagrams).
5. **Cell phones** are **NOT** allowed in the Examination Room.
6. The marks shown against the requirement(s) for each question should be taken as an indication of the expected length and depth of the answer.
7. All workings must be done in the answer booklet.
8. Discount Factor tables/Present Value and Annuity Tables are attached at the end of the question paper.
9. Graph paper (if required) is provided at the end of the answer booklet.

SECTION A

This is a compulsory question and it MUST be attempted.

QUESTION ONE

Nyamaidega Ltd (NL) a renowned security firm has been providing services for the past 10 years. The company is being run by family members who give directions as to how the business has to be conducted.

NL, like any other business has experienced the effects of downturn in the economy in the last eighteen months and this requires the management to make radical decisions to save the company from failure.

NL offers the following services:

- Private Investigations (PI)
- Vehicle tracking (VT)
- Security guard services (SGS)
- Analogue surveillance cameras (ASC)

Its clientele is comprised of both corporate bodies and individuals. The analysis of the above services has indicated that they are provided in the ratio 1:3:4:5. NL's total fixed costs have been approximately K300, 000 per annum. At the recent meeting Management proposed a return on investment of 120% of fixed costs.

For the year 2014, the following budgeted information was made available.

Service	Average number of clients	Fee charge per service (K)	Variable cost Per service (K)	Fixed cost per service (K)
PI	300	1,400	900	70
VT	200	1,650	650	72
SGS	500	2,200	2,000	75
ASC	400	1,950	1,825	80

The newly appointed management accountant, Sharon Habuba, has expressed reservations on NL's budgeting process and performance evaluation. The managing Director has observed that with the prevailing economic environment, the current budgeting process is the most ideal for company.

Required:

- (a) Discuss the imposed style of budgeting. (14 marks)
- (b) Discuss how the management accountant can improve the quality of the budgetary control system. (6 marks)

- (c) Calculate:
- (i) the number of clients of each service that will be sold at the breakeven point. (4 marks)
 - (ii) the breakeven revenue for each service. (4 marks)
 - (iii) the margin of safety, expressed as a percentage (%). (2 marks)
- (d) Prepare the profit volume graph using the above information. (6 marks)
- (e) Explain the graph prepared in (d) above (4 marks)

[Total 40 marks]

QUESTION TWO

Hold Plc has two subsidiaries being run as profit centres name Gold Farms Ltd (GF) and Fold Ltd (FL). GF grows soya beans which it sells to FL and the external market. FL uses the soya beans to manufacture cooking oil whose brand name is 'Good'. FL sells this product to the external market.

GF produces 1,000 tonnes annually. Currently it sells 500 tonnes to the external market and 300 tonnes to FL.

The two managers of the subsidiaries agreed to a transfer price of K6,000 per tonne some six months ago but due to increased competition the market price per tonne has dropped to K5,400.

FL's manager now suggests that the transfer price be adjusted in line with the current market price. GF's manager has argued that the cost of production is still high for his company. He has proposed that the transfer price be adjusted next year so as not to disturb the already approved budgets for the current year.

FL extracts 500 litres of cooking oil from each tonne of soya beans. It sells each litre at K20. It would sell a further 100,000 litres if the price is reduced to K13 per litre.

The management accountant at the head office has made available to you the following data:

Company	Variable costs(K) per tonne	Annual fixed costs (K)
Gold Farms Ltd	2,100	2,000,000
Fold Ltd	1,200	600,000

FL's variable costs does not include the transfer price of the soya bean from GL.

Required:

- (a) Based on both K6,000 and K5,400 transfer prices, when producing at 80% capacity, prepare a profit statement showing the profit for each company and for Hold Plc as a whole. Clearly split the sales into external and internal sales, where appropriate.
(6 marks)
- (b) Based on both K6,000 and K5,400 transfer prices, when producing at 100% capacity, prepare a profit statement showing the profit for each company and for Hold Plc as a whole. Clearly split the sales into external and internal sales, where appropriate.
(6 marks)
- (c) Comment on the effect that might result from a change in the transfer price from K6,000 to K5,400.
(4 marks)
- (d) Discuss the alternative transfer price that would provide an incentive for FL to reduce the selling price and increase sales by 20,000 liters.
(4 marks)

[Total: 20 marks]

QUESTION THREE

Muchinga Plc (M plc) has designed and developed a product called Zedi. M Plc is considering whether to start production or not because a competitor called Mosi Ltd has offered K 250,000 for the exclusive rights to produce and sell the Zedi products. This amount would be payable immediately.

Below is the following additional information

- (i) The product will require 5kg per unit of material A. This material is regularly used by M plc in the manufacture of other products. There are currently 100,000 kg of material A in inventory. These materials were bought a long time ago at K5.75 per unit. The current market price is K8 per unit.
- (ii) The current workforce is fully engaged in other work and therefore, additional employees will have to be hired at a cost of K25,000 payable at the beginning of production. It is expected that at the end of the product's life, redundancy costs will be K60,000. Every unit produced will incur a labour cost of K15.
- (iii) The company has incurred a market research cost of K125,000 which will be paid in year 1. The research was conducted to establish product demand for the Zedi over the life of the product.
- (iv) If production commences, additional costs of K145,000 per year will be incurred.

- (v) Working capital of K55,000 will be incurred immediately and will increase to K60,000 in year one.
- (vi) The product can be produced using a machine which M PLC owns. The machine costs K350,000 and has a net book value of K120,000. This machine is no longer in use and could be sold for K 65,000 if the product is not produced. Should the machine be used in the manufacture of the product then the scrap value will be K20,000 at the end of the project.
- (vii) The sales director projects demand to be 12,000 units per annum and would be sold for K80 per unit over the next four years.
- (viii) M PLC uses a post-tax cost of capital of 15%.
- (ix) Working capital and other incremental costs will be financed partly by 10% GRZ bond of K120,000 at 10% p.a. interest.

Required:

- (i) Assuming that M PLC manufactures the Zedi, explain briefly the relevant and irrelevant cash flows from information given above. (6 marks)
- (ii) Calculate the net present value of the product Zedi and advise whether the project is viable or not. (7 marks)
- (iii) Calculate the internal rate of return (IRR) of the project. (2 marks)
- (iv) Calculate the sensitivity of the annual labour cost. The sensitivity factor should be shown as an absolute figure as well as a (percentage) amount. (3 marks)
- (v) Calculate correct to two decimal places, the discounted payback period for product Zedi. (2 marks)

[Total: 20 marks]

QUESTION FOUR

Nansenga Football Club (NFC) has a successful history of twenty five (25) years of which thirteen (13) it was crowned as the league champion. However, recently the financial performance of the club has been below expectation due to several factors. Five (5) years ago NFC decided to sell their stadium to the local government.

Due to the uncertain nature of this business, it is the NFC's policy to hire the stadia for all its home football matches.

NFC needs to decide now what level of advance hire contract to commit for the coming year. There are three stadium sitting capacities to choose among – high capacity, medium capacity and low capacity. The costs of annual advance hire are K312,500, K225,000 and K160,000, respectively.

At the point of entering into these advance hire agreements, NFC does not have confirmed bookings for games, so it does not know exactly how much sitting capacity it may need. NFC management has estimated a set of probabilities for the game bookings, along with projections of turnover and variable cost proportions as follows:

There are three categories of football matches: Cup, league and charity.

Bookings	Revenue K'000	Probability %	Variable cost as % of revenue
Cup games	1,250	35	70
League games	1,050	50	72
Charity games	850	15	75

Cup games need a high level of sitting capacity; league games require medium capacity and charity games low capacity.

(No refunds will be available if the advance hire contract provides a level of capacity in excess of that which is required).

In the event of the advance hire agreements providing insufficient capacity, NFC will have to pay premiums to obtain additional seats. Details of these premiums are as follows:

Advance hire capacity	Required capacity	Premium to pay K'000
Medium	High	125
Low	High	235
Low	Medium	90

Required:

- Construct a pay-off table showing the potential profit for NFC for the coming year for each of the nine possible outcomes. (9 marks)
- Using expected values, advise NFC which advance hire contract it should accept and discuss the limitations of basing decisions on expected values. (8 marks)

- (c) Calculate the maximum amount that NFC would be willing to pay for researched information. (3 marks)

[Total 20 marks]

QUESTION FIVE

- (a) Muzimai Chalwe, a financial controller of Busy Bee Enterprises, has commented as follows:

"Buying new materials in large quantities from a large number of suppliers is old fashioned. She emphasized that world class manufacturing requires JIT purchasing and production".

Required:

Discuss the Five (5) main elements of a JIT production system in sufficient detail.

(15 marks)

- (b) The EOQ model assumes the demand for each item of materials occurs independently of other activities. However, in complex manufacturing environments the demand for material purchasing is not independent. It is dependent on the volume of the planned output of components and sub-components which include the raw materials that must be purchased.

Required:

Explain briefly the materials requirements planning (MRP) systems.

(5 marks)

[Total: 20 marks]

END OF PAPER

Formulae Sheet

Learning curve

$$Y = ax^b$$

Where Y = cumulative average time per unit to produce x units

a = the time taken for the first unit of output

x = the cumulative number of units produced

b = the index of learning ($\log LR / \log 2$)

LR = the learning rate as a decimal

Demand curve

$$P = a - bQ$$

$$b = \frac{\text{change in price}}{\text{change in quantity}}$$

a = price when Q = 0

$$MR = a - 2bQ$$

Modified Internal Rate of Return

$$MIRR = \left[\frac{PV_R}{PV_I} \right]^{\frac{1}{n}} (1 + r_e) - 1$$

Present Value Table

Present value of 1 i.e. $(1 + r)^{-n}$

Where r = discount rate

n = number of periods until payment

		Discount rate (r)									
Periods (n)	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	1
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826	2
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751	3
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683	4
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621	5
6	0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564	6
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513	7
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467	8
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424	9
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386	10
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350	11
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319	12
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290	13
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263	14
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239	15
(n)	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	1
2	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694	2
3	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579	3
4	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482	4
5	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402	5
6	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335	6
7	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279	7
8	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233	8
9	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.225	0.209	0.194	9
10	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162	10
11	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135	11
12	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112	12
13	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093	13
14	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078	14
15	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.074	0.065	15

Annuity Table

Present value of an annuity of 1 i.e. $\frac{1 - (1 + r)^{-n}}{r}$

Where r = discount rate
 n = number of periods

Periods (n)	Discount rate (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	1
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736	2
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487	3
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170	4
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791	5
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355	6
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868	7
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335	8
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759	9
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145	10
11	10.37	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495	11
12	11.26	10.58	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814	12
13	12.13	11.35	10.63	9.986	9.394	8.853	8.358	7.904	7.487	7.103	13
14	13.00	12.11	11.30	10.56	9.899	9.295	8.745	8.244	7.786	7.367	14
15	13.87	12.85	11.94	11.12	10.38	9.712	9.108	8.559	8.061	7.606	15
(n)	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	1
2	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528	2
3	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106	3
4	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589	4
5	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991	5
6	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326	6
7	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605	7
8	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837	8
9	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031	9
10	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192	10
11	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327	11
12	6.492	6.194	5.918	5.660	5.421	5.197	4.988	4.793	4.611	4.439	12
13	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533	13
14	6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611	14
15	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675	15

P2: ADVANCED MANAGEMENT ACCOUNTING
SUGGESTED SOLUTIONS
DECEMBER EXAMINATIONS

SOLUTION ONE

- (a) An imposed style of budgeting is a budget allowance which is set without permitting the ultimate budget holder to have the opportunity to participate in the budgeting process.

In this approach to budgeting, top management prepare a budget with little or no input from operating personnel which is then imposed upon the employees who have to work to the budgeted figures. This approach could be ideal during periods of economic hardship. Though using this style for budget setting has advantages and disadvantages.

Advantages

- (i) Strategic plans are likely to be incorporated into planned activities.
- (ii) They enhance the coordination between the plans and objectives of divisions.
- (iii) They use senior management's awareness of total resource availability.
- (iv) They decrease the input from inexperienced or uninformed lower-level employees.
- (v) They decrease the period of time taken to draw up the budgets.

Disadvantages

- (i) Dissatisfaction, defensiveness and low morale amongst employees. It is hard for people to be motivated to achieve targets set by somebody else.
- (ii) The feeling of team spirit may disappear.
- (iii) The acceptance of organizational goals and objectives could be limited.
- (iv) The feeling of the budget as a punitive device could arise.
- (v) Managers who are performing operations on a day to day basis are likely to have a better understanding of what is achievable.
- (vi) Unachievable budgets could result if consideration is not given to local operating and political environments. This applies particularly to overseas divisions.

- (b) The following are roles of the management accountant in the improvement (or maintenance) of the quality of the budgetary control system:

- (i) Develop a working relationship with operational managers, going out to meet them and discussing the control reports.
- (ii) Explain the meaning of budgets and control reports.
- (iii) Keep accounting jargon in these reports to a minimum.
- (iv) Make reports clear and to the point, for example using the principle of reporting by exception.
- (v) Provide control information with a minimum of delay.

- (vi) Make control information as useful as possible, by distinguishing between directly attributable and controllable costs over which a manager should have influence and apportioned or fixed costs which are unavoidable or uncontrollable.
- (vii) Make sure that actual costs are recorded accurately.
- (viii) Ensure that budgets are up-to-date, either by having a system of rolling budgets, or else by updating budgets or standards as necessary, and ensuring that standards are 'fair' so that control information is realistic.

(c)

(i) BEP (Number of services)

$$\text{PI} : 1 \times 61 = 61$$

$$\text{VT} : 3 \times 61 = 183$$

$$\text{SGS} : 4 \times 61 = 244$$

$$\text{ASC} : 5 \times 61 = 305$$

(ii) BEP (Revenue)

$$\text{PI} : 61 \times 1400 = \text{K}85,400$$

$$\text{VT} : 183 \times 1650 = \text{K}301,950$$

$$\text{SGS} : 244 \times 2200 = \text{K}536,800$$

$$\text{ASC} : 305 \times 1950 = \underline{\text{K}594,950}$$

$$\text{Total} \quad \underline{\text{K}1,518,900}$$

(iii) Margin of safety

$$\frac{2,630,000 - 1,518,900}{2,630,000} \times 100\% = 42\%$$

Workings

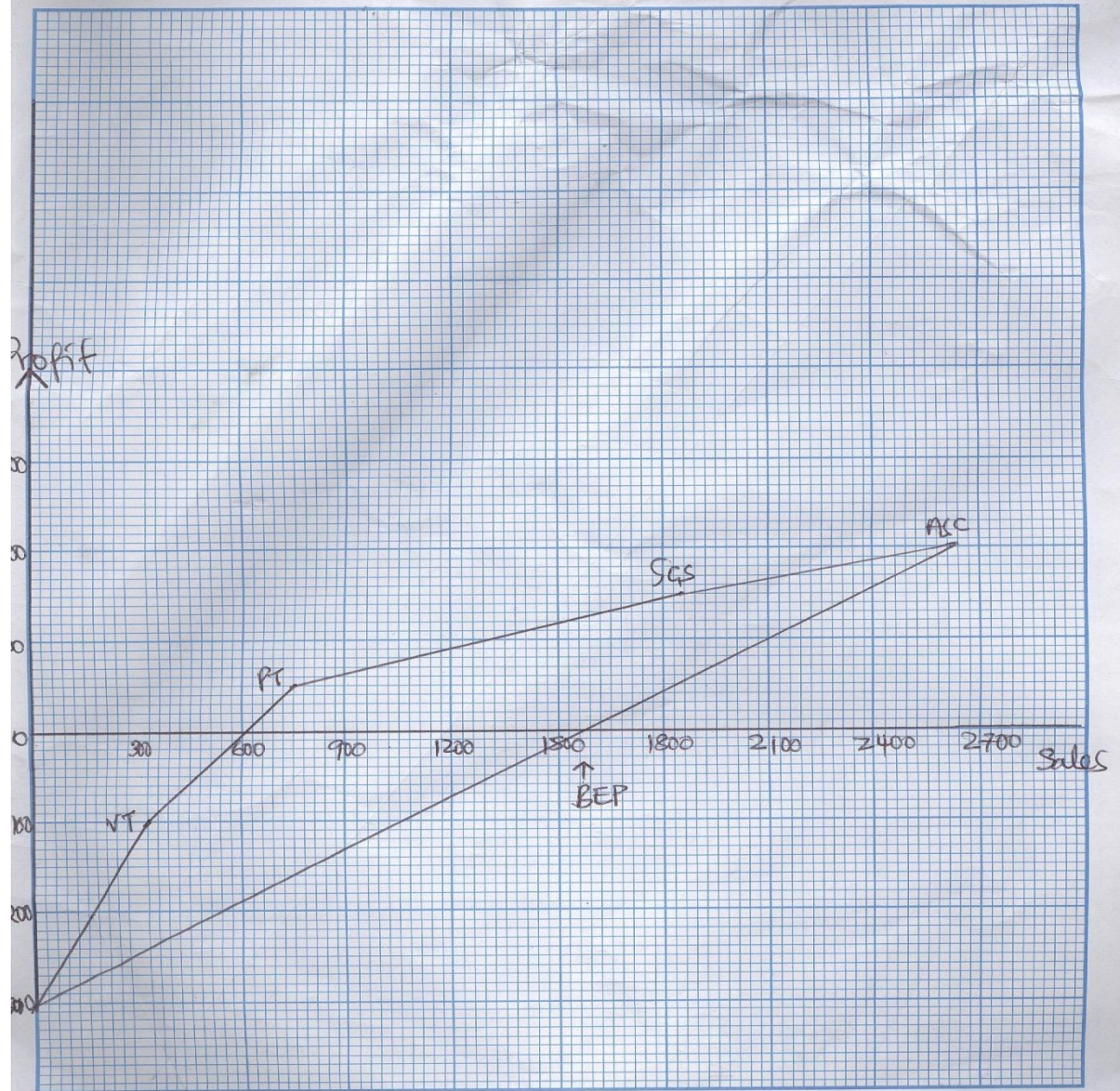
1. $\text{BEP (mixes)} = 300,000/4,925 = 61 \text{ mixes}$

2.

	PI	VT	SGS	ASC	TOTAL
Fee charge	1,400	1,700	2,200	1,950	
Variable cost	(900)	(650)	(2,000)	(1,825)	
Contribution	500	1000	200	125	
Proportion mix	1	3	4	5	
Contribution per mix	500	3,000	800	625	4,925

(d) Profit Volume Chart

GRAPH PAGE



Please attach any supplementary book BEHIND this answer book.

X-axis represents sales

Y-axis represents profit

(e) Service VT has the highest C/S ratio which is able to cover the fixed costs and the therefore the highest profitable service. The overall BEP occurs after the VT's. NL may actually decide to concentrate on this particular service in order to maximize its profitability.

PRODUCT	REVENUE	CUMMULATIVE REVENUE	CONTRIBUTION	CUMMULATIVE PROFIT
	-	-	-	-300,000
VT	330,000.00	330,000.00	200,000.00	-100,000
PT	420,000.00	750,000.00	150,000.00	50,000
SGS	1,100,000.00	1,850,000.00	100,000.00	150,000
ASC	780,000.00	2,630,000.00	50,000.00	200,000

SOLUTION TWO

(a) Profit statement operating at 80% capacity

Transfer price at K6,000

	GL K'000	FL K'000	Hold Plc K'000
Sales:			
External	2,700	3,000	5,700
Transfer	<u>1,800</u>	<u>-</u>	<u>-</u>
	<u>4,500</u>	<u>3,000</u>	<u>5,700</u>
Costs:			
Transfer	-	(1,800)	-
Variable	(1,680)	(360)	(2,040)
Fixed	<u>(2,000)</u>	<u>(600)</u>	<u>(2,600)</u>
Profit	<u>820</u>	<u>240</u>	<u>1,060</u>

Transfer price at K5,400

	GL K'000	FL K'000	Hold Plc K'000
Sales:			
External	2,700	3,000	5,700
Transfer	<u>1,620</u>	<u>-</u>	<u>-</u>
	<u>4,320</u>	<u>3,000</u>	<u>5,700</u>

Costs:			
Transfer	-	(1,620)	-
Variable	(1,680)	(360)	(2,040)
Fixed	<u>(2,000)</u>	<u>(600)</u>	<u>(2,600)</u>
Profit	<u>640</u>	<u>420</u>	<u>1,060</u>

(b) Profit statement operating at 100% capacity

Transfer price at K6,000

	GL K'000	FL K'000	Hold Plc K'000
Sales:			
External	2,700	3,250	5,950
Transfer	<u>3,000</u>	<u>-</u>	<u>-</u>
	<u>5,700</u>	<u>3,250</u>	<u>5,950</u>
Costs:			
Transfer	-	(3,000)	-
Variable	(2,100)	(600)	(2,700)
Fixed	<u>(2,000)</u>	<u>(600)</u>	<u>(2,600)</u>
Profit	<u>1,600</u>	<u>(950)</u>	<u>650</u>

Transfer price at K5,400

	GL K'000	FL K'000	Hold Plc K'000
Sales:			
External	2,700	3,250	5,950
Transfer	<u>2,700</u>	<u>-</u>	<u>-</u>
	<u>5,400</u>	<u>3,250</u>	<u>5,950</u>
Costs:			
Transfer	-	(2,700)	-
Variable	(2,100)	(600)	(2,700)
Fixed	<u>(2,000)</u>	<u>(600)</u>	<u>(2,600)</u>
Profit	<u>1,300</u>	<u>(650)</u>	<u>650</u>

- (c) The effect of a change in the transfer price from K6,000 to K5,400 will result in lower profit for GL and higher profit for FL, but the total profit for the company as a whole will be remain the same.

The K5,400 is the market price and therefore recommended. This is the maximum FL would be willing to spend, anything above this, FL would prefer to buy externally which is not the interest the company as a whole.

The reduction in the selling price whilst maintaining the transfer price will not be the best interest on FL.

- (d) Reducing the selling price would increase external sales and variable costs in FL. Cash flows will improve. However, the transfer price for GL should not be less than the variable cost. The transfer prices should be set between K2,100 and K5,400. For example the two managers would agree on the middle figure of K3,750 as it would give profit to both subsidiaries and the company as a whole.

SOLUTION THREE

- i) Relevant cash flows

Exclusive Rights Production Offer of K250,000.

This is relevant. If M Plc decides to produce the Zedi product itself it will forego K250,000. This is an opportunity cost

Material A

Material A is in regular use. The relevant cost is the current replacement cost, i.e. $5\text{kg} \times \text{K}8 \times 12,000 \text{ units} = \text{K}480,000$ p.a. The original cost of K5.75/kg is irrelevant, i.e. it is a sunk cost.

Labour Hire and Redundancy Costs

The labour hire cost of K25,000 and redundancy costs of K60,000 are relevant: they are future incremental cash flows. Also the labour cost of K15 per unit is relevant (total = $\text{K}15 \times 12,000 = \text{K}180,000$) because it is a future incremental cash flow.

Market Research Costs

These are irrelevant because they are sunk costs

Additional Costs

They are relevant: future incremental cash flows.

Working Capital

This is relevant as it is a future cash outflow. It is assumed that the K60,000 will be recovered at the end of the products life.

Machinery

The original cost and the written down value are irrelevant costs, i.e. sunk costs. The K65,000 sale proceeds (if the machinery is scrapped now) are relevant as they are a form of opportunity costs. Similarly, the scrap value (K20,000) at the end of the product's life are future inflows and, therefore, relevant.

Sales Revenue

Total incremental sales revenues of $K80 \times 12,000 = K960,000$ are relevant.

Interest on GRZ Bonds

Interest payments are irrelevant because they are already incorporated in the cost of capital of 15%. If included, it would be a duplication of costs.

ii) NPV Model

	K'000				
Year	0	1	2	3	4
Current Machine (opportunity cost)	(65)	–	–	–	–
Scrap Value (Current machine)	–	–	–	–	20
Offer (Opportunity Cost)	(250)	–	–	–	–
Materials	–	(480)	(480)	(480)	(480)
Labour Hire	(25)	–	–	–	–
Labour Redundancy cost	–	–	–	–	(60)
Labour Cost	–	(180)	(180)	(180)	(180)
Other Costs	–	(145)	(145)	(145)	(145)
Working Capital	(55)	(5)	–	–	60
Sales Revenues	–	960	960	960	960
Net cash flow	(395)	150	155	155	175
Discount Factors @ 15%	1.0	0.870	0.756	0.658	0.572
PV	(395)	130	117	102	100

NPV 54

Advice: On financial grounds, the project is worthwhile because the NPV is positive.

iii) Try 25% IRR

Net Cash flow	(395)	150	155	155	175
Discount factor @ 25%	1.0	0.800	0.640	0.512	0.410
PV	(395)	120	99	79	72
					<u>NPV (25)</u>

$$IRR = A\% + \left(\frac{P}{P + N}\right)(B\% - A\%)$$

$$= 15\% + \left(\frac{54}{54 + 25}\right)(25\% - 15\%)$$

$$= 15\% + 6.84\%$$

$$= \underline{21.83\%}$$

Where:

A% = Cost of Capital giving positive NPV

B% = Cost of Capital giving Negative NPV

P = Positive NPV

N = Negative NPV

iv) Discounted Payback Period

<u>Year</u>	<u>PV</u>	<u>Cumulative PV</u>
0	(395)	(395)
1	130	(265)
2	117	(148)
3	102	(46)
4	100	54

$$\text{Discounted Payback Period} = 3 \frac{46}{100} = 3.46 \text{ years}$$

v) Sensitivity of Labour Costs

- Annual labour costs per annum for 4 years = K180,000
- Sensitivity Factor (Percentage terms)

$$= \frac{NPV}{PV \text{ of Labour Cost}} \times 100\%$$

$$= \frac{K54,000}{K180,000 \times 2.855} \times 100\%$$

$$\underline{\underline{= 10.5\%}}$$

- Sensitivity Factor (Absolute terms)

$$= \frac{NPV}{Annuity \text{ Factor}}$$

$$= \frac{K54,000}{2.855}$$

$$\underline{\underline{= K18,914 \text{ Per annum}}}$$

SOLUTION FOUR

(a) Pay-off table

	High K'000	Advance hire capacity Medium K'000	Low K'000
Bookings			
Cup	62.5 (w1)	25 (w2)*	(20) (w3)*
League	(18.5) (w4)	69 (w5)	44 (w6)*
Charity	(100) (w7)	(12.50) (w8)	52.5 (w9)

*premium payable (see workings)

(b) Calculate expected values for all advance hire agreements

Bookings	Probabilities	Advance hire capacity		
		High	Medium	Low
	%			
Big	35	21.88	8.75	(7.00)
Standard	50	(9.25)	34.50	22.00
Small	15	<u>(15.00)</u>	<u>(1.88)</u>	<u>7.88</u>
Expected Value K'000s		<u>(2.38)</u>	41.37	22.88

Based on expected values, NFC would accept the medium capacity advance hire contract.

Other considerations

There are a number of considerations that NFC should take into account before making a decision to accept the medium capacity contract.

- i) The limitations of the expected value analysis that has been carried out must be understood. Making a decision based on selecting the maximum expected value is considered to be a risk neutral decision. The good result (league bookings and a profit of K69,000) is balanced against the poor result (charity bookings and a loss of K12,500).
- ii) The expected value will actually provide a long-run weighted average figure. For example, for the medium capacity agreement, a profit equal to the expected value of K41,375 will never actually be attained. Over a number of years, given all the same conditions, the profits would average out to this value, however. Expected values are therefore better suited for frequently repeated decisions.
- iii) NFC will need to give considerable thought to the potential downside of selecting the medium capacity agreement – the loss of K12,500 if bookings turn out to be charity games only.
- iv) If a medium capacity agreement is selected, and bookings turn out to be for Cup games, the company will need to hire additional equipment. The analysis and information provided so far gives no indication as to how easy it will be to do this. There may be delays in obtaining additional equipment or the equipment may be less reliable, in which case any loss of customer goodwill will also need to be factored into the calculations.
- v) All the calculations are assumed to have been carried out on the basis of reliable and accurate estimates. If the variable cost percentages change this could considerably alter the results of the calculations. Similarly, if the revenues or hire premiums are altered this could impact on the results.

Despite all these limitations expected value analysis is a popular decision tool for dealing with such uncertain situations. NFC management need to consider carefully the above factors before making their decision.

(c) Firstly, calculate the expected value with perfect information. Using the table in (a):

If events are Cup, select high capacity, earning K62,500

If events are League, select medium capacity, earning K69,000

If events are Charity, select low capacity, earning K52,500

$$\begin{aligned}\text{EV with perfect information} &= (0.35 \times 62,500) + (0.5 \times 69,000) + (0.15 \times 52,500) \\ &= \text{K}21,875 + \text{K}34,500 + \text{K}7,875 \\ &= \text{K}64,250\end{aligned}$$

Value of perfect information = EV with perfect information – EV without perfect information
(answer to (b))

$$\begin{aligned}&= \text{K}64,250 - \text{K}41,375 \\ &= \text{K}22,875\end{aligned}$$

The maximum that NFC should pay for this information is K22,875.

Workings

1.	K'000
Contribution = $(1 - 0.7) \times 1,250$	375.00
Less: advance hire	<u>(312.50)</u>
Profit	<u>62.50</u>
2.	
Contribution = $(1 - 0.7) \times 1,250$	375.00
Less: advance hire	(225.00)
Premium	<u>(125.00)</u>
Profit	<u>25.00</u>
3.	
Contribution = $(1 - 0.7) \times 1,250$	375.00
Less: advance hire	(160.00)
Premium	<u>(235.00)</u>
Loss	<u>(20.00)</u>
4.	
Contribution = $(1 - 0.72) \times 1,050$	294.00
Less: advance hire	<u>(312.50)</u>
Loss	<u>(18.50)</u>

5.	
Contribution = $(1 - 0.72) \times 1,050$	294.00
Less: advance hire	<u>(225.00)</u>
Profit	<u>69.00</u>
6.	
Contribution = $(1 - 0.72) \times 1,050$	294.00
Less: advance hire	(160.00)
Premium	<u>(90.00)</u>
Profit	<u>44.00</u>
7.	
Contribution = $(1 - 0.75) \times 850$	212.50
Less: advance hire	<u>(312.50)</u>
Loss	<u>(100.00)</u>
8.	
Contribution = $(1 - 0.75) \times 850$	212.50
Less: advance hire	<u>(225.50)</u>
Loss	<u>(12.50)</u>
9.	
Contribution = $(1 - 0.75) \times 850$	212.50
Less: advance hire	<u>(160.00)</u>
Profit	<u>52.50</u>

SOLUTION FIVE

Organising manufacturing cells

Traditional manufacturing plants usually have a layout in which machines that perform the same function are located in the same area or department. JIT plants, however, organize machines in "cells" designed around products. Different types of machines performing the various functions involved in manufacturing a product are placed close to each other. Materials move from one machine to another and operations are performed in sequence. Incoming and outgoing materials for individual cells are located near to the cell rather than at a central location, thus reducing handling costs. Workers or conveyor belts carry materials from one cell to the next.

Multi-skilled workers

Workers are trained to perform all operations within the cell. Workers can then be transferred between different machines as needed in order to achieve smooth production flow. Workers are also trained to perform minor repairs and undertake routine maintenance. Quality testing and inspection are also the responsibility of the workers in a cell rather than of a quality assurance department.

Total quality management

If a worker on a given operation discovers a defect, the individual must alert other workers to the problem: that operation is then shut down. When one operation shuts down, all production shuts down until the problem is solved. JIT focuses on immediacy in problem-solving and the elimination of the causes of defects. Thus total quality management is an essential component of any JIT production system.

However, in traditional systems, extra parts and subassemblies are held at workstations in anticipation of shortages or production breakdowns. These inventories can service a 'downstream' operation even if a defect occurs: consequently there is less need for – and less emphasis on – preventing rework and spoilage.

Reducing manufacturing lead time and set-up time

Reducing manufacturing lead time enables a company to respond better to changes in customer demand. An important aspect of reducing manufacturing lead time is reducing set-up time. When set-up time is long, plant managers tend to manufacture many units of a product because they want to spread the costs of the set-up over as many units as possible. This causes inventory to build up until such time that units are sold.

Reducing set-up times makes production in smaller batches economical and worthwhile, and this reduces inventory levels. One approach to reducing set-up is to use manufacturing cells dedicated to the manufacture of a product or product family, rather than multiple products. Another is to improve set-up processes and to train workers to do set-ups more quickly.

Strong supplier relationships

Many companies implementing JIT production also implement JIT purchasing. This is the purchase of goods or materials such that delivery immediately precedes demand. JIT plants expect JIT suppliers to provide high quality goods and make frequent deliveries of the exact quantities specified as required. Suppliers often deliver materials directly and they are immediately placed into production. Consequently, JIT plants require suppliers to inspect their

own goods and guarantee their quality. These produces completely eliminate the costs for incoming inspection storage, and inventory- handling.

Strong relationships with suppliers are an important part JIT purchasing because production stops if a supplier fails to deliver materials on time. Building partnerships with suppliers is time-consuming and costly. It involves the negotiation of long-term contracts so that minimal paperwork is involved in each transaction. A single telephone call or computer entry triggers the delivery of material. Hence, JIT companies choose to work with only a few reliable and dependable suppliers.

a) Materials Requirements Planning

(MRP) is a system which maximizes the efficiency in the timing of raw materials orders to the manufacture and assembly of the final product. MRP is a computerized approach for coordinating the planning of materials acquisition and production. The major feature of MRP is that it first involves an estimation of the quantity and timing of finished goods demanded and then uses this to determine the requirements for components/ sub-components at each of the prior stages of production. This provides the basis for determining the quantity and timing of purchased materials and any bought-in components. The aim of MRP is to generate a planned coordinated schedule of materials requirements for a specified time period for each item of material.

END OF SOLUTIONS