

**MET2****MANUFACTURING ENGINEERING TRIPOS PART IIA****Paper 5 Answer Sheet****Section A**

1(a) Retained earnings:	£	£
Balance as per the Balance Sheet		80,000
Less: 1. Sale proceeds of plant	6,000	
2. Loss on sale of plant	9,000	
3. Provision for compensation	<u>15,000</u>	
		<u>30,000</u>
		50,000
Add: 1. Wages capitalised	4,000	
2. Materials used for extension	10,000	
3. Materials drawn from existing stock for extension	<u>2,000</u>	
		<u>16,000</u>
		<u>66,000</u>

Workings (1)

	£
Cost of plant	25,000
Less depreciation @ 10% from 2010-2013	<u>10,000</u>
Book value	15,000
Sale proceeds	<u>6,000</u>
Loss on sale	<u>9,000</u>

Workings (2)

	£'000
Fixed assets at cost	240
Less cost of plant sold	<u>25</u>
	215
Add: Capitalisation in respect of extension of warehouse	<u>16</u>
Balance	<u>231</u>

(b) Balance Sheet of Cedar & Co Ltd. As on 31<sup>st</sup> March 2014

	£'000		£'000	£'000
Ordinary share capital	130	Fixed asset at cost	231	
Retained earnings	66	Less accumulated	<u>60</u>	
Sundry creditors	20			171
		Stock		30
Provisions	15	Sundry creditors		20
		Bank		<u>10</u>
	<u>231</u>			<u>231</u>

(c) Depreciation is the systematic allocation of the depreciable amount of an asset over its useful life.

The expense of depreciation recognises that non-current assets are used up in the process of generating revenue

- (i) The company makes capital investments in non-current assets (*capital expenditures*)
- (ii) The assets' loss of value is recognised as an operating expense (depreciation) and also recognised on the balance sheet, because the value of the assets will now be reduced.

Depreciation achieves two things: spreads the cost of the asset charged to P&L over the N years of expected use and reflects its declining value in the Balance Sheet each year.

The straight-line method is simple to use but subject to criticism that the true depreciation is faster than this.

The reducing balance method give faster depreciation based on a constant percentage of the net book value being charged. The charge against profit declines each year and the net book value declines more quickly than in the straight line method. The charge against profit may be stable as the cost of repairs of the asset may well rise with its age.

*Examiner's Comments:*

*The candidates were good in answering parts (c). On average the answers to part (a) and (b) was satisfactory but with more variation in terms of quality. In particular, students found it difficult to provide the correct adjustment for the depreciation in part (a) of the question.*

2. (a)

(i) Return on Equity = Net Profit ÷ Average Stockholders' Equity\*

$$2011: \text{£}17,000 \div \text{£}31,000 = .548$$

$$2012: \text{£}18,000 \div \text{£}35,500 = .507$$

\*2010 numbers needed for averages, so the above ratios use the ending number from the balance sheet

(ii) Operating profit margin = (Net Profit + [Interest Expense]) ÷ Net Sales (Revenues)

$$2011: \text{£}17,000 + [2,000] \div \text{£}70,000 = .271$$

$$2012: \text{£}18,000 + [2,000] \div \text{£}74,000 = .270$$

(iii) Current Ratio = Current Assets ÷ Current Liabilities

$$2011: \text{£}14,000 \div \text{£}7,000 = 2.0$$

$$2012: \text{£}21,000 \div \text{£}9,000 = 2.33$$

(iv) Debt/Equity Ratio = Total Liabilities ÷ Total Stockholders' Equity

$$2011: \text{£}33,000 \div \text{£}31,000 = 1.065$$

$$2012: \text{£}33,000 \div \text{£}40,000 = .825$$

(b) Given the limited information, I would support only a short-term loan rather than a long-term loan. The return on equity has declined while the operating profit margin has remained

stable, indicating that the company is not making any gains in its profitability. The current ratio is encouraging, indicating the company's short-term solvency is not in question. In terms of cash flows, the company's cash flow from operating activities is positive but declining considerably. It seems it is financing its asset base partly from long-term loans and partly from its own operations. Overall, as a bank loan officer, my bank's interest will be safely protected if I approve only a short-term loan and not a long-term loan.

(c) Generally, a lot more information is available to a bank loan officer to decide upon a long-term loan. Further information required include among others:

- (i) trends of the ratios over several years
- (ii) projections of the financial performance into the future
- (iii) ratios of firms in the industry and hence benchmarks of performance
- (iv) growth strategy of the firm
- (v) any new technologies and companies that might increase the competition and reduce profitability
- (vi) any major changes in government policies that might impact on the business
- (vii) any changes in regulation that might impact on the business

*Examiner's Comments:*

*Students were able to answer question (a) very well. The better students were able to discuss the cash flows in relation to the ratios for part (b). The answers to question c were also reasonably well answered.*

## Section B

### 3. Platts (£'000)

(a)	t0	t1	t2	t3	t4	
Revenue		4800	4800	5000	5000	
Efficiency gains			600	600	600	
Additional revenue			300	300	300	
Cornish's additional salary		-150	-150	-150	-150	
Incremental costs		-960	-960	-1000	-1000	
Working capital	W3	-480		-20	500	
Operating profits		3210	4590	4730	5250	
Opportunity cost - land sale	W1	-18000				
Capital investment for new facility		-10500				
Sale of old facility		2000				
Sale of new facility					16000	
Net cash flow		-10500	-12790	4590	4730	21750
Discount rate			10%	10%	10%	10%
Discount factor		1	0.9091	0.8264	0.7513	0.6830
PV of cash flow		-10500	-11627	3793	3554	14855
NPV			<u>75</u>			

Irrelevant costs:

Feasibility cost of £500,000 - sunk cost

Historical land cost of £10m and surveyor's valuation of £20m

Allocated fixed head office overhead costs of £1m

Workings:

**W1**

Land sale  $18/1.1 = 16.3636$

**W2**

Depreciation is non-cash flow - hence to be excluded from NPV calculations

Depreciation pa =  $(9500-1000)/4 = 2125$

**W3**

Investment in working capital

t1  $-4800 \times 10\% = -480$

t3  $(4800-5000) \times 10\% = -20$

Release of working capital in t4 = 500

The NPV is marginally positive at £75K indicating that the project should be undertaken.

However, given the marginally positive cashflow on an investment of £10.5m and that there

is uncertainty in the cashflow and the risks involved, the project should be evaluated using other investment appraisal criteria (e.g., the payback period) and make a more comprehensive assessment of whether it would be worth investing in the project.

(b) The three capital appraisal techniques, with specific advantages and disadvantages are summarised below.

<i>Technique</i>	<i>Advantages</i>	<i>Disadvantages</i>
<b>Net present value</b>		
Discounts future expected cash flows by cost of capital.	<ol style="list-style-type: none"> <li>1. Takes into account the time value of money.</li> <li>2. Looks at all cash flows.</li> </ol>	<ol style="list-style-type: none"> <li>1. Need to estimate a specific discount rate.</li> <li>2. All cash flows assumed to be at end of year.</li> <li>3. Can be complex.</li> </ol>
<b>Internal rate of return</b>		
The discount rate which gives a net present value of zero.	<ol style="list-style-type: none"> <li>1. Takes into account time value of money.</li> <li>2. Looks at all cash flows.</li> <li>3. Determines break-even rate of return.</li> </ol>	<ol style="list-style-type: none"> <li>1. No need to estimate a specific discount rate.</li> <li>2. Difficult to understand.</li> <li>3. In certain circumstances may give misleading results (e.g., non-conventional cash flow)</li> <li>4. Complex.</li> </ol>
<b>Payback</b>		
Measures the cumulative cash inflows less their cumulative outflows. The point at which they coincide is the payback. It is measured in years.	<ol style="list-style-type: none"> <li>1. Easy to use and understand.</li> <li>2. Very cautious method.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fails to take into account cash flows after payback.</li> <li>2. Fails to take into account the time value of money.</li> </ol>

*Examiner's Comments:*

*Part (a) required students to assess the investment opportunity using the NPV investment appraisal methods. Part (a) was done well on average although often there were mistakes made in terms of items like whether and when to include depreciation and overheads. Section (b) was done satisfactorily with some good discussions on the advantages and disadvantages of the different investment appraisal methods.*

4. (a) (i)	£
Cost of material for each gnome	140,000
Cost of material for 93,200 gnomes = $140,000/93,200=$	1.50
Stock of direct materials: 5,600 kg.	
Value of stock of materials $5,600/5 \times 1.50=$ £1,680	

(ii) Cost of production of 93,200 gnomes	£
Total cost	466,200
Less: Selling cost	
Fixed	38,300
Variable	<u>33,700</u>
	<u>72,000</u>
	394,200
Less: Administration costs	<u>68,000</u>
Cost of production of 93,200 gnomes	<u>326,200</u>

Unit cost of production:  $326,200/93,200= 3.5$   
Therefore, the number of gnomes in stock =  $29,750/3.5=8,500$   
(iii) Number of gnomes sold =  $93,200-8,500=84,700$   
Selling price of each gnome =  $457,200/84,700=£5.40$   
(iv) Income statement for the year ended 31 March 2012

	£	£
Sales		457,200
Less: Cost of sales		
Cost of production	326,200	
Closing stock (29,750+1,680)	<u>31,430</u>	
		<u>294,770</u>
		162,430
Less: Administration expenses	68,000	
Selling expenses	<u>72,000</u>	
		<u>140,000</u>
Net profit		<u>22,430</u>

(b) Percentage of net profit to sales ==  $22,430/457,200 \times 100=4.9\%$

Additional item of financial information required are:

- (i) rate of return on capital employed
- (ii) returns from other similar businesses
- (iii) cost of capital (debt and equity capital)

*Examiner's Comments:*

*Part (a) required students to calculate various costing and stock levels including profits. Students did very well in being able to show the calculations clearly in part (a) and was generally of a very good standard. Part (b) was more varied with some students being able to*

*provide a more insightful account of the other information required to make a fuller assessment.*

**Section C**

5 (a)

		HOTEL B	
		Collude	Compete
HOTEL A	Collude	(40, 40)	(10, 50)
	Compete	(50, 10)	(30, 30)

Begin with a simplified situation of just two luxury hotels. Assume the payoff matrix shown above (the 1<sup>st</sup> figure in each box shows profit in millions of Euros to Hotel B, the 2nd figure shows profits to the Hotel A).

In the absence of coordination, each hotel will reject the “collude” option in the knowledge that its rival can increase profits by choosing to “compete”. Hence both end up earning €30m. However, with communication they can agree to collude and increase their profits to €40m each. A long history of coexistence and similar values and norms between the hotels probably facilitated collusion.

The situation is different when a significant customer (e.g. a tour operator or a corporation) asks for a discount. Each hotel knows that, unless a discount is offered, that customer is likely to go elsewhere. If a hotel has rooms available, there is a strong incentive to offer a substantial discount—the incremental cost of letting a room rather than leaving it empty is small. While communication over list prices (“rack rates”) is simple (it needs to happen just once a year), communicating and reaching agreement over discounts to individual customers would be very difficult. The attractions of offering individually negotiated discounts are increased by the likelihood that they will remain secret.

(b) A real option is an alternative or choice that becomes available with a business investment opportunity. Real options have the principle that a firm has the right but not the obligation to exercise the option on the investment opportunity/asset. Real options can include opportunities to expand and cease projects if certain conditions arise, amongst other options. They are referred to as "real" because they usually pertain to tangible assets such as capital equipment, rather than financial instruments. Real options allow a firm to modify the commitment as conditions evolve. Delay commitment until better information is available on profitability. A real option exists if future information can be used to tailor decisions. Key balancing ‘learn rate’ (receive new information to adjust strategy) versus ‘burn rate’ (irreversible commitments). Real options points to two major types of option: flexibility options and growth options.

The company could create options by increasing flexibility throughout its whole range of activities. For example, to take account of opportunities to exploit lower costs resulting from exchange rate movements it could move to shorter contracts with its suppliers, or have contracts which are more flexible with regard to quantity. It could require that suppliers reorganize their production processes to allow greater flexibility with regard to colour and size to permit faster responses to market preferences. In terms of growth options, the company could make initial investments in new product areas, new markets, and new product and process technologies.

Alliances including minority investments in companies which offer the potential to diversify into new product areas would also create option value.

*Examiner's Comments:*

*Most students who attempted this question did well and had a good grasp of the concepts. The better students were able to discuss the limitations of the game theory models and the sources of real options value respectively.*

6 (a) Unless a new process is revolutionary (e.g. Pilkington's float glass process), new processes are typically incremental improvements or reconfigurations of existing processes. In such cases, process patents can be circumvented. Moreover, alternative mechanisms for protecting innovations—e.g. secrecy, lead time, and manufacturing capabilities—tend to be more effective for process innovations than product innovations. In particular, since processes cannot be easily viewed by competitors, secrecy is highly effective in protecting process innovations. On the other hand, product innovations are more visible and hence can be copied more easily by competitors. Therefore, product innovations require patents more than process innovations in order to protect intellectual property and make superior returns for firms.

(b) A large, multibusiness firm—whether a vertically integrated firm comprising multiple vertical stages, a multiproduct company, or a multinational company—comprises a number of business units presided over by a corporate head office. In a stable environment, most decisions are of a routine nature and can be made lower down in the organization. In a turbulent environment, changing circumstances require that increasing numbers of decisions go up to the corporate level. The likelihood is that corporate managers become overburdened and the speed of decision making slows.

However, in terms of overall adaptability to change, much depends upon the nature of the business turbulence and the type of coordination required. In the case of vertical integration, uncertainty over the level of demand from day to day encourages purchasing from independent suppliers (most umbrella retailers buy rather than make their umbrella).

Conversely, a business where design changes are very rapid—fashion clothing—a firm may find it can adapt more swiftly to changing design preferences by being vertically integrated rather than continually negotiating new market contracts i.e., contracts are invariably incomplete and hence, firms will try to internalise such external costs of renegotiating contracts when there is a turbulent external environment.

*Examiner's Comments:*

*This question was generally well answered. However, better students were able to go beyond merely discussing the visibility aspects of product versus process innovations (i.e., products are more visible than processes) and provide examples of when patents were better at protecting product and process innovations respectively.*

## Section D

7. (a) A business model is the approach to doing business that describes the revenue model and the accompanying cost structure that enables the firm to deliver the customer value proposition using the marketing mix. A business model summarises the architecture and logic of a business and defines the organisation's value proposition and its approach to value creation and value capture. Some definitions might also include the value network i.e., which firms the firm forms collaboration to design and deliver the proposition.

Other similar definitions are also acceptable as there are no standard agreed definition.

(b) Possible business models include among others (1) Collecting the data and creating the content but using other organisations to distribute (2) Act only as a distributor by buying content from other sources (3) Neither acting as a content provider nor distributor but merely renting the brand and acting as an orchestrator (ala Nike)

(c) Challenges includes (1) overcoming internal resistance from employees (2) mental models of the existing business models might act as a constraint (e.g., Xerox and PARC) (3) resource constraints (4) metrics of the existing business model might act as a constraint to innovate. This is because the new business model might not look as attractive when evaluated using the metrics of the existing business.

8. (a) Segmentation by the attributes of the product or customers e.g. product type, demographics or psychographics. An alternative form of segmentation is 'job-based' segmentation. 'Job-based' segmentation involves segmentation by understanding the jobs that customers need to get done and then hiring the product or services to get that job done. Attribute based segmentation can reveal correlations between attributes and outcomes but does not necessarily explain causality. 'Job-based' segmentation offers a plausible statement of causality built on the circumstances that cause the customer to buy a product or service.

### *Examiner's Comments:*

*The question required students to explain what is a business model, apply it to a mobile-phone based commodity price information distribution firm and its challenges in implementing such business model innovation. Most students answered parts (a) and (b) reasonably well. For part (c) the better students were able to give examples of challenges across different dimensions of business model innovation and also relate it to examples from other industries.*

(b) For example, if job based segmentation is chosen. Description of the jobs that low income communities need to get done. Description of the possible efficiency and timing of when the solar torch lights would fulfil certain jobs. What are the features of the solar torch lights that would serve these jobs better than alternatives e.g., kerosene lamps. Discussion of

- alternative lighting methods to get that job done.
- attributes of people that are likely to use solar torch lights.
- market size based on demographics, community activities (e.g., schools) and personal/professional use (e.g., home, farming, fishing etc).

- how the market could expand as a result of introducing the specific types of solar torch lights in Tanzania.

Similar description needs to be discussed of any chosen method of segmentation.

(c) Discussion of the challenges such as

- availability of data might be limited in terms of product attributes, demographics or psychographics
- changing tastes and patterns of how light is used e.g., due to changing demographic make up of population and jobs in the villages.
- difficult to assess potential competitive response of other lighting methods.

*Examiner's Comments:*

*Part (a) required an explanation of basic segmentation methods. Part (b) required an application of the segmentation method and part (c) a discussion of some of the challenges. This question produced some good answers overall with differences showing predominantly in part (c) where better students were able to relate to the example and discuss some of the challenges in segmentation in low income communities.*

CV