Original

Candidate: Last name: First name:

Matriculation Number:

For use of examiner only →	1	2	3	4	5	6	Σ	Grade

The following aids can be used: calculator

Hint: A total of 120 points can be achieved. For each problem 20 points are achievable. You are advised to base your time allocation on these points.

Please enter your answers in the space provided in these sheets and return for grading. Only answers in these sheets will be considered.

This problem set consists of 7 pages. Please check whether it is complete.

Problems:

1. A company has two departments: procurement and production. The existing cost system treats procurement costs as overhead costs and allocates them according to direct material costs. Procurement costs were $1200 in March while production overhead cost amounting to $1000. Production overhead is allocated using machine hrs. General and administrative (G&A) costs are fixed and amounted to $700. The traditional cost system allocates them on the basis of total cost before G&A. Two customers A and B were served in March:

	A	B
Revenue ($)	5000	3000
Direct costs ($)		
Direct material ($)	2000	1000
Direct labor ($)	1200	600
Machine hrs.	400	400

The company considers introducing *ABC* and has figured out that procurement cost is driven by the number of orders to be processed in the procurement department. Customer A caused 100 procurement orders, customer B 300. Using the reciprocal method, 40% of G&A cost would be charged to the cost pool of procurement, 60% to the cost pool of production.

Required:
Calculate the cost allocated to the two customers
a) by the existing costing system
b) by the ABC system.
c) Assume half of the production overhead is fixed depreciation, and 80% of the procurement costs are long-run committed salary. What is the contribution margin of each customer over flexible cost?
d) Which of the customers seems to be more profitable according to each of the three costing systems? What system's results are informative for management? Why?

Fill in your numerical answers in the following tables on the following next page.

a)

a)	Customer A	Customer B
Procurement cost		
Production overhead		
Direct cost		
G&A		
Total allocated cost		

b)

b)	Customer A	Customer B
Procurement cost 1200 + 280		
Production overhead 1000 + 420		
Direct cost		
Total allocated cost		

c)

c)	Customer A	Customer B
Procurement cost		
Production overhead		
Direct cost		
Flexible Cost		
Contribution		

d)

2. Assume the normal capacity of a cost center is 150 machine hrs. per month. Normal cost at this capacity is € 16 000, € 10 000 of which are committed costs. Actual volume in February 02 was 120 machine hrs. Actual cost amounted to € 15 000.

Required: Calculate
a) the *flexible cost budget* C(x) as a function of actual volume x,
b) the cost budget of the center for January 02,
c) the *usage variance* for January 02,
d) the cost of idle capacity, for January 02.
e) The company rejected an extraordinary contract offer that would have required 25 machine hrs. at a contribution margin of € 60 per machine hr. Analyze the rejection decision.

Answers:

3. **Break-even Analysis.** The purchase price of a Diesel-powered car exceeds the price of a the comparable gas type car by € 5000. Furthermore the tax on motor vehicles is € 250 higher per year for the Diesel. Fuel costs of a Diesel, however, are €5 lower per 100 km.

Required:
a) Assume both types of car will be sold at the same price after T = 10 years. Disregarding the time value of money, calculate the break-even number of km per year at which the Diesel becomes favorable.

Answer:

b) Same as a) assuming an interest rate of 6% per year.

Answer:

c) Comment on the effect of interest.

d) Assume you take into account that an accident after n years may destroy your car. Assume you drive 25 000 km each year. What is the payoff period of the additional purchase price for the Diesel (i.e. how many years without an accident are needed to justify the decision in favor of the Diesel)? Assume again an interest rate of 6%.
No numerical calculations required. Give an equation for the payoff period n°.

Answer:

4. **4. *Short-run versus long-run cost function.*** A chemical products company plans the size of the reactor for a specific base chemical. The reactor size determines the batch size q [in kg] for the production. Activity-based cost per batch is F, materials cost c [per kg of the product]. The product requires storage costs of h [per kg per year]. The demand x [in kg per year] for the product is expected to be fairly constant over time at any given price.

Required:

a) Management wishes to know the optimal long-run *cost function* C*(x) [per year] for deciding on price and quantity to supply.

   - Develop the formula for the yearly cost dependent on q and x:

   - Determine the optimal batch size as a function of x:

b) After building the reactor the batch size is fixed. Determine the short-run cost function S(y|x) for demand volumes y differing from the forecasted demand level x.

c) Determine the relationship between the short-run fixed cost and C*(x).

5. *Evaluating investments.* A manager is to evaluate the purchase of a new machine tool at a purchase price of € 100. Its useful life is two years, cash flow expected for the first year is € 0, for the second year € 120. The company uses a required rate of return of 10% p.a. before tax and straight line depreciation. The corporate tax rate is 50%. The manager gets a bonus based on pre-tax accounting income (which is expected to be positive, irrespective of whether the machine is bought or not.) His personal discount rate is 5% (ignoring personal taxation).

Required:
Evaluate the profitability of the machine
a) ignoring taxes
b) profitability accounting for taxes.
c) Show that, in the present case, after-tax residual income as a basis for the incentive pay aligns the manager's self-interested investment decision to the owners' objectives.
d) This is an example of the so called *taxation paradox*. Can you tell why?

Answers:

6. ***Moral hazard in teams***. Ali and Bev work together in a team. The expected outcome P of their joint effort depends on Ali's effort level x and Bev's effort level y according to the following function:

$$P(x, y) = (xy)^{1/4}$$

Both the effort levels and the outcome are measured on the same utility scale. The actual outcome depends on unobservable external influences so that no inference on the individual effort levels is possible from the actual outcome. They agree on sharing the outcome equally.

Required:
a) Calculate the first best effort level of the two teamers.
b) Calculate the payoff of each of the two, provided they stick to their agreement.
c) What effort level will they choose, when they behave rationally?
d) What will be their payoff under the conditions of c)?

Answers: