ISE 307: Engineering Economic Analysis (Term 253)

In-Class Activity-25

Final Exam Practice

Name: _____ **Student ID:** _____

Section: _____ **Date:** _____

Setup. A machining workshop is evaluating a **CNC cutting machine** (**5-year** life). The company depreciates by **double-declining balance**, its marginal tax rate is $t = 25\%$, and the MARR is **10%**. The purchasing file shows:

Invoice price of the machine	54,000 SAR
Freight to the workshop	2,400 SAR
Installation and alignment	3,600 SAR
Operator training course (completed and paid **last year**)	5,000 SAR
Maintenance contract (paid **every year**; already in the operating expenses below)	6,000 SAR/yr

The estimated salvage value is **6,000 SAR** at the end of year 5. In every operating year the machine generates revenues of **40,000 SAR** and cash operating expenses of **16,000 SAR**.

Problem 1: The Depreciation Schedule

(a) (7 pts) Complete **(i)**–**(iv)** of the DDB schedule ($\alpha = 2/N = 40\%$).

n	D_n	B_n
1	24,000	36,000
2	**(i)**	21,600
3	8,640	**(ii)**
4	5,184	7,776
5	**(iii)**	**(iv)**

Problem 2: From Profit to Cash

(b) (5 pts) Complete the marked cells of the year-1 and year-3 income statements (all values in SAR):

	Year 1	**Year 3**
Revenues	40,000	40,000
− Cash operating expenses	16,000	16,000
− Depreciation	24,000	**(iii)**
Taxable income	**(i)**	15,360
− Income tax (25%)		3,840
Net income		**(iv)**
+ Depreciation (add back)	24,000	**(iii)**
ATCF	**(ii)**	**(v)**

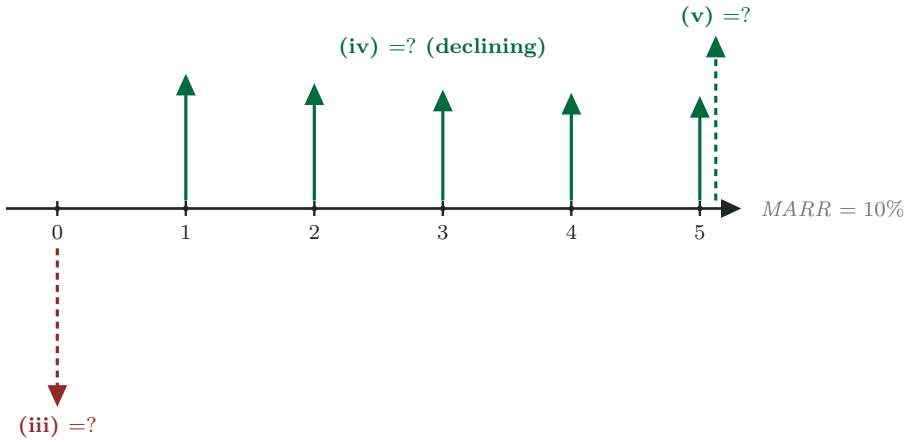
(c) (4 pts) In year 1 the machine reports **zero accounting profit**, yet it banks a large positive cash flow. Explain why!

(d) (3 pts) At the end of year 5 the machine actually sells for **9,000 SAR**. Compute the **net proceeds**.

(e) (10 pts) Complete the two blanked cells of the ATCF table,

n	1	2	3	4	5
D_n	24,000	14,400	8,640	5,184	*from (a)*
ATCF_n	24,000	21,600	**(i)**	19,296	**(ii)**

then give the values of the three blank labels of the after-tax cash flow diagram. Finally, compute the **PW at the MARR** and state your recommendation.



Problem 3: How Wrong Can the Estimates Be?

An AI agent put the whole evaluation in a spreadsheet (inputs in labeled cells; the after-tax flows of years 0–5 in `C10:C15`, year 0 in `C10`; revenue input in `B5`) and produced a one-way sensitivity table around the base-case PW you found in (e):

PW (SAR)	−20%	−10%	base	+10%	+20%
annual revenue	1,824	13,196	24,568	35,941	47,313
operating cost	33,666	29,117	24,568	20,019	15,470

(f) (5 pts) Calculate the revenue cushion (the % revenue slip that makes $PW = 0$). If we incur a **20% revenue shortfall**, will the **accept** decision remain the same? Explain why!

(g) (3 pts) Assuming now there's a probability of:

- 5% probability that the revenue will be 20% less than the base case,
- 15% probability that the revenue will be 10% less than the base case,
- 60% probability that the revenue will be the base case
- 10% probability that the revenue will be 10% higher than the base case
- 10% probability that the revenue will be 20% higher than the base case,

which gives an expected revenue of **40,200 SAR** and standard deviation of about **3,682 SAR**. What do these numbers tell you about the project risk?

(h) (3 pts) The following year, the actual revenue is 10% higher than the base case. A senior engineer claims that we made a mistake in the revenue estimate. Is this justified? Explain why!