Name:

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| --- | --- | --- |
| Problem | Points | Score |
| 1 | 20 |  |
| 2 | 20 |  |
| 3 | 20 |  |
| 4 | 20 |  |
| 5 | 20 |  |
| Total | 100 |  |

Notes:

1. The exam is closed books and notes except for four double-sided sheet of notes. You must use Excel to do these problems.
2. Please indicate clearly your answer to the problem. Circle your answers.
3. The details of your solutions are more important than the answers. Please explain your solutions clearly and include as many details as possible.
4. EMAIL ME YOUR EXCEL SPREADSHEET.

**1.** Tempura, Inc., is considering two projects. Project A requires an investment of $50,000. Estimated annual receipts for 20 years are $20,000; estimated annual costs are $12,500. An alternative project, B, requires an investment of $75,000, has annual receipts for 20 years of $28,000, and has annual costs of $18,000. Assume both projects have zero salvage value and that MARR is 12 percent/year. Based on an external rate of return analysis, which project should be recommended?

**2.** A surface mount PCB placement/soldering line for the manufacture of electronic components is to be installed for $1.6 million with an expected life of 6 years. Determine the depreciation deduction and the resulting unrecovered investment during each year of the asset’s life using MACRS-GDS allowances.

**3.** Abbott placed into service a flexible manufacturing cell costing $850,000 early this year. They financed $425,000 of it at 11 percent per year over 5 years. Gross income due to the cell is expected to be $750,000 with deductible expenses of $475,000. Depreciation is based on MACRS-GDS, and the cell is in the 7-year property class. Abbott’s marginal tax rate is 40 percent, MARR is 10 percent after taxes, and they expect to keep the cell for 8 years. Determine the PW, FW, AW, IRR, and ERR for the investment if the loan is paid back using Method 2 (equal annual principal payments plus interest on the unpaid loan balance).

**4.** Steinway R&D is pursuing the development of an attachment that can easily clean the inside of grand pianos. This innovation will require a loan of $500,000 for fabrication and testing of several units. Inflation is 3.9 percent, and the loan is available to them at a rate of 10 percent. Their combined MARR is 17 percent. The loan is to be paid back over 4 years. What is the amount to be paid at the end of each year and the PW (using both then-current and constant-dollar approaches) if repayment follows Method 2 (make equal annual principal payments each year, plus interest on the unpaid balance)?

**5.** A pork-processing facility is considering installing either a storage facility or a holding pond. A biosystems engineer has been hired to evaluate the economic trade-offs for the two alternatives. The engineer estimates the cost of the storage facility to be $213,000, with annual costs for maintenance to be $3,200 per year. She estimates the cost of the pond to be $90,000, plus $45,000 for pumps and piping; annual operating and maintenance costs for the holding pond are estimated to be $8,500. The engineer estimates the life of the storage facility and the pond to be around 20 years but is concerned about the accuracy of this estimate. She decides to do a sensitivity analysis.

a. Develop the equation she should use to determine how sensitive the economic decision is to changes in life. Use a MARR of 15 percent.

b. Determine which alternative is preferred for lives ranging from 15 to 25 years in 1-year increments.

