Name:

|  |  |  |
| --- | --- | --- |
| Problem | Points | Score |
| 1(a) | 5 |  |
| 1(b) | 10 |  |
| 1(c) | 10 |  |
| 1(d) | 10 |  |
| 1(e) | 10 |  |
| 1(f) | 5 |  |
| 2 | 25 |  |
| 3 | 25 |  |
| Total | 100 |  |

Notes:

1. The exam is closed books and notes except for one double-sided sheet of notes. You are allowed the use of a calculator, interest tables or MS Excel on this exam.
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. You are considering investing in three machines with parameters shown below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Machine** | **Purchase Price** | **Useful Life (Years)** | **Revenue Per Year** | **Maintenance Costs Per Year** | **Salvage Value** |
| **A** | $10,000 | 2 | $5,000 | $1,000 | $0 |
| **B** | $20,000 | 4 | $7,500 | $2,000 | $2,500 |
| **C** | $30,000 | 6 | $10,000 | $3,000 | $5,000 |

Assuming a MARR of 5%, you must evaluate these investments and choose the most preferred.

(a) Create a cash flow diagram for the investment and explain your choice of a planning horizon.

(b) Select the most preferred based on Present Worth (PW).

(c) Select the most preferred based on Future Worth (FW).

(d) Select the most preferred based on Annual Worth (AW).

(e) Plot AW as a function of the MARR for MARRs ranging from 0% to 20% in steps of 1%.

(f) If you answers to (b)-(d) differ, explain why (don’t simply state they are different, probe the data above to determine what aspect of the investment causes these differences). If they are the same, justify that conclusion through an analysis of the data.

**2.** Several years ago, a man won $27 million in the state lottery. To pay off the winner, the state planned to make an initial $1 million payment immediately, followed by equal annual payments of $1.3 million at the end of each year for the next 20 years. Just before receiving any money, the man offered to sell the winning ticket back to the state for a one- time immediate payment of $14.4 million. If the state uses a 6%/year MARR, should it accept the man’s offer? Use an annual worth analysis. Explain your answer.

**3.** Starting at age 25, you contribute $10,000 per year to your retirement plan for 40 years. Assume that the average annual effective interest rate of your portfolio is 5%. Compute the amount of money you can withdraw annually when you retire so that your money will be depleted in 25 years (at which point you will be 90 years old). If inflation averages 3% over the next 65 years, will this income be sufficient?