**Question 1** (15%)

Given the data below, make an appropriate forecast for the following year:

|  |  |
| --- | --- |
| Period | Demand (Yt) |
| 1 | 19 |
| 2 | 20 |
| 3 | 18 |
| 4 | 19 |
| 5 | 17 |
| 6 | ? |

* using a 3-period moving average
* using a naive forecast for period 6
* using an exponential smoothing (an alpha of 0.4 and period 1 as the initial forecast)
* using a linear trend line

**Question 2** (15%)

ABC company has recorded the following sales (000 omitted).

|  |  |
| --- | --- |
| Year | Sales, $ |
| 1994 | 10 |
| 1995 | 20 |
| 1996 | 30 |
| 1997 | 45 |
| 1998 | 70 |
| 1999 | 90 |
| 2000 | 125 |
| 2001 | 150 |
| 2002 | 180 |
| 2003 | 220 |
| 2004 | 270 |
| 2005 | ? |

1. Compute 2005 sales, using the method of least squares
2. Compute the coefficient of determination
3. Comment on the reliability of the estimated sales equation, together with the necessary assumptions if the estimated equation is to be used to predict sales.

**Question 3** (15%)

A film processor company has the following production function:

Q = 0.5K2 + 0.3KL + 0.4L2

Assume a weekly rate of use where L = 110 labor hours and K = 40 film developing hours. Determine the following:

1. The total product per week.
2. The marginal product of labor.
3. The marginal product of capital.

**Question 4** (10%)

A company has developed the following production function for its coal output:

Q – 250L0.5K0.6

1. Determine return to scale, and comment on it.
2. Determine returns to scale for each factor input.

**Question 5** (15%)

The total product of labor (per hour) for a firm is given by:

Q = 30L – 0.5L2

1. Determine the marginal product of labor.
2. How many workers should the firm employ if the wage rate is $30 per hour and the marginal revenue product is $24.

**Question 6** (15%)

Given the cost function for your firm: TC = 30 +3Q +2Q2

1. What is the average fixed cost (AFC) of producing 5 units of output?
2. What is the average variable cost (AVC) of producing 5 units of output?
3. What are the average total cost (ATC) and marginal cost (MC) of producing 5 units of output?

**Question 7** (15%)

Given the following total cost (TC) function:

TC = 100 + 70Q - 1.5Q2 + 0.01Q3

1. Calculate the marginal cost (MC), average variable cost (AVC), average cost (AC), and average fixed cost (AFC) functions.
2. At what level of output does MC reach its minimum? AVC? AFC?
3. Determine MC and AVC when AVC is at its minimum.
4. Prove that short-run MC equals AVC when AVC is at its minimum.