

Energy Resources & Utilization

Session: 2k9 - 6th term

Open Book Paper

Max. Marks = 60

Note: Attach Excel Work Sheet with your answer book. Submit the Answer Book on-line by writing Paper-09-ME-ABC in subject of your e-mail. Use Winzip/Winrar to zip all your answers in one folder and name it as 09-ME-ABC. You have 72 hours to do this work. Try to solve with clarity and also be precise. Each Paper consists of 4 Questions and accommodates 24 students (06 groups). Try to solve the paper individually as copying is strictly forbidden and may liable to cancel the paper. You must follow the announced 'Layout' and 'rules' as information were provided in advance.

Question#01

Demand is given by $q^D(p) = 1200 - p$. The Supply function is $q^S(p) = 300 + 2p$

Use Excel to plot the demand and supply curves on a graph, and indicate the market equilibrium. Determine the market equilibrium by calculating it (using algebra).

Question#02

A large electricity producer faces a production cost of $C(q) = 1.5q^2 + 15q$. The electricity provider acts as a monopolist, i.e., there are no competitors in the market. The monopolist faces demand, given by the inverse demand function $p(q) = 90 - 4.5q$.

Which output level q^* and price p^* does the firm choose to maximize profit?

Define the producer's marginal revenue and marginal cost as a function of q . Solve for quantity q^* and determine the price p^* . Plot the graphs by using Excel.

Alternatively, we can formulate the same demand function as a function of price: $q(p) = 20 - 2/9 p$.

Use $q(p)$ to formulate profit as a function of price, and solve the problem by maximizing $\pi(p)$. Find p^* and then q^* . Attach Excel sheet with your answer book.

Question#03

Calculate energy savings based on insulation implemented in building codes

Old houses (older than 30 years): average roof insulation of 100mm

New initiative: 300mm mandatory when replacing roof on old houses

Assume:

Average old house has annual consumption of 50 GJ for heating purposes

By insulating (100 to 300 mm of roof insulation) 20% of consumption can be saved

Savings are based on a temperature of 20 degree Celsius indoor and 100 m² heated area on average.

For the national energy savings plan this initiative is estimated to contribute to reducing energy consumption by 1% in 5 years.

question 1:

Heating price: 30 €/ GJ

How much is the annual savings for each house replacing roof?

question 2:

Then you have to consider consumer behavior:

Price elasticity for residential heating is -0.2

What happens to heating demand?

How can that be interpreted? – What is the purpose of the “new” heat demand?

question 3:

Now assume that there exist 350 000 old houses.

Assume that 5% of the initial stock of old houses have replaced roof every year.

What is the annual energy savings in heat demand after 5 years?

question 4:

What is total consumption before introduction of the new initiative compared to the consumption 5 years later?

Question#04

The graph below shows the energy situation at the base year 2007 in Pakistan. Summarize the information by selecting and reporting the main features and make comparisons where relevant.

You should write at least 250 words.

