

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

A manufacturer of industrial furnaces produces a quantity of 'q' for which it incurs production costs of $C(q) = 12q^3 - 270q^2 + 2700q$. The market price for each unit of the product sold is $P = \$2439$.

Which output level q does the firm choose to maximize profit?

Derive the first and second order conditions.

What is the firm's marginal revenue?

What are the firm's marginal and average cost functions?

Graphical representation:

- 1) Plot profit in one graph;
- 2) Plot marginal cost, price and average cost in 2nd graph;
- 3) Plot total cost and revenue in a third graph

Use Excel to plot the graph. Also attach the excel sheet containing the data and graph in your answer book.

Question#02

An energy market is regulated by authorities by setting price caps equal to marginal production costs.

No new producer entry to the market is allowed. It is assumed that the regulator has full information about costs and demand.

Two producers are granted access to the market.

Producer 'X' has costs of $C(q) = 1.3q^2 + 20 + 2q$

Producer 'Y' has costs of $C(q) = 1.3q$

Producer 'Y' has a maximum production capacity of 20 units.

The market demand is given by $D(p) = 40$

Asked Questions:

Find the equilibrium price and quantity for the market.

Calculate profits for each of the two producers.

Use Excel to plot the graph. Also attach the excel sheet containing the data and graph in your answer book.

Question#03

Write about the following topic:

The following table shows the primary energy supplies to residential sector (Urban and Rural). Briefly explain and make your arguments that how we may be able to restrict our energy supplies in future. Furthermore, give your recommendations to pay attention towards the promising energy carriers which should be indigenous and sustainable.

Write at least 300 words.

Fuel Type	Primary Energy(PJ)	Residential(Urban)	Residential(Rural)
Kerosene	4.84	0.55	4.29
LPG	19.4	7.43	11.97
Domestic Coal	0.02	0.0	0.02
Natural Gas	191.89	181.92	9.97
Electricity Distributed	124.22	96.38	27.84
Wood (Free)	249.72	2.94	246.78
Wood (Purchased)	220.41	55.89	164.52
Dung (Free)	67.38	0.63	66.75
Dung (Purchased)	40.59	11.99	28.61
Crop Residues (Free)	48.48	0.31	48.17
Crop Residues (Purchased)	26.47	5.82	20.64
Total	993.41	363.86	629.55

Question#04

Write a brief note on adoption Solar Water Heaters for water heating/space heating for a middle class family living in Islamabad. What are the barriers and challenges to replace the inefficient gas water heaters? Draw your conclusion on basis of economic analysis. You may assume the suitable No. of households by referring the published reference in this regard or on the basis of educational guess. The water heating requirement should be on average of 6. persons in a home. Also conclude the energy requirement in water/space heating by daily use pattern of the dwelling.

Write at least 500 words.