

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 newly established company started a business of fabricating the efficient commercial cooking stove. The company claims the efficiency of this particular stove is 70% with respect to traditional stove; which is about 12 % energy efficient. The market price of the stove is PKR 12000. The company incurs total cost of $C(q) = 10000q + q^2$.

Find the following;

1. Profit maximizing quantity q^*
2. Marginal cost
3. Profit π^*
4. Marginal revenue
5. What is the total cost incurred at profit maximum?
6. 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. Prices are also regulated so that Marginal Cost (MC) = price

Two producers are granted access to the market.

Producer 'X' has costs of $C(q) = 3q^2 + 1 + 0.5q$

Producer 'Y' has costs of $C(q) = 3q + 2.25q^2$

The market demand is given by $D(p) = 200 - 2p$

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

To encourage the investment for the Renewable Energy Technologies (Biogas plant (5m³) and PV cells (1kW)) used for a residential dwelling in times of energy outages, draw a smart analysis for the daily use of these technologies. How much solar energy transforms to electricity in southern Punjab district say, Multan, in a day time for a whole year. Determine the sizing of solar system with 18 hours backup. Take solar intensity averages both for winter and summer seasons. Biogas plant is used for cooking and water/space heating in winter and only cooking for summer. Also plot typical daily demand for bio gas in average family home (6 persons/house) in excel sheet. *Attach the excel sheet containing the data and graph in your answer book.*

Question#04

Write about the following topic:

The following table shows the energy supplies needed to fulfill the required energy services to residential sector (Urban and Rural). Average energy service/household (Urban/Rural) is also given. Briefly explain and make your arguments that how we may be able to reduce/conserve our energy services in future. Furthermore, also give your recommendations to pay attention towards the utilization of energy efficient appliances. Also do some basic simple payback period analysis and prioritize the more attracting appliances used to provide the energy services.

Write at least 400 words.

Energy Service	Residential(Urban)			Residential(Rural)		
	Final Energy (PJ)	Useful Energy (PJ)	Energy Service/Households (MJ)	Final Energy (PJ)	Useful Energy(PJ)	Energy Service/Households(MJ)
Space Heating	31.94	24.70	5700	*1.73	5.79	3004
Water Heating	28.88	16.89	5181	*1.56	5.96	3054
Cooling(Fans)	28.89	27.55	3575	9.65	9.21	790
Cooling(Air cons/Coolers)	16.71	15.58	20677	0.89	0.85	72.7
Lighting	46.63	23.29	1949	35.77	20.64	856.3
Cooking	206.16	71.82	22330	594.41	57.59	25790
Refrigeration	12.94	6.82	1600	5.58	1.86	129.3
Miscellaneous	21.70	21.70	2685	3.94	3.94	322
Others				0.02	0.02	19.7
Total	363.86			629.55		

* Demand fulfilled by cooking too.