

The Open University of Sri Lanka
Faculty of Engineering Technology



Study Programme	: Master of Technology in Industrial Engineering - Level 07
Name of the Examination	: Final Examination
Course Code and Title	: MEX7125 - Energy Management in Industries
Academic Year	: 2013/14
Date	: Thursday 04 September 2014
Time	: 0930 - 1230 hrs
Duration	: 3 hours

General instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of 6 questions.
3. Answer **Question 1** (28 marks) and **four** other questions (18 marks each).

Q1. (Compulsory question)

Table 1 below gives the details of electricity consumption of an industrial organisation, taken from CEB electricity bills. Table 2 below shows the firewood consumption for a boiler in the same industry and taken from daily log sheet.

Electricity supply is charged according to industrial tariff I-2, as follows.

Peak consumption	- at Rs.21.00 per kWh
Day consumption	- at Rs. 11.30 per kWh
Off Peak consumption	- at Rs. 7.00 per kWh
Maximum demand charge	- at Rs. 1,100 per kVA
Fixed charge	- at Rs. 3,000 per month
Fuel adjustment charge	- at 15% of energy charge

And

Cost of firewood is Rs. 1,250 per Yard.

Answer the following questions.

- a) Calculate the total yearly energy cost of the organisation. (10 marks)
- b) Calculate the share of each energy source in the total annual energy consumption. (18 marks)

Tip: Convert energy consumed by both sources into common energy units.

Use following data where necessary for your computations.

1 kWh of electricity = 3.6 MJ

Calorific value of firewood = 13 MJ/kg

1 Yard of firewood = 275 kg

Table 1: Electricity Consumption from National Grid

Year	Month	kVA	kWh		
			Peak	Day	Off Peak
2012	January	139	9,772	30,140	18,565
	February	136	9,726	29,938	17,880
	March	148	11,230	34,557	22,095
	April	167	9,140	29,028	19,242
	May	170	9,885	29,794	18,900
	June	129	8,513	24,888	14,556
	July	140	9,025	26,860	16,770
	August	137	12,043	37,494	21,197
	September	168	9,883	31,201	20,012
	October	145	9,871	29,046	18,967
	November	162	11,277	37,779	24,235
	December	158	11,210	35,278	21,344

Table 2: Firewood consumption

Year	Month	Consumption
		Yards
2012	January	421.50
	February	350.75
	March	417.25
	April	410.50
	May	475.75
	June	414.25
	July	466.75
	August	395.75
	September	495.50
	October	553.50
	November	711.25
	December	711.00

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Q2. Write short notes on any four (04) of the following.

- a) Effect of Power Factor on maximum demand
- b) Need of Steam Traps in steam distribution systems
- c) Energy labelling as a strategy for promoting energy efficiency
- d) Environmental impacts of Global Warming
- e) Carbon Footprint as a marketing tool

(4.5 marks each)

Q3.

- a) Explain the term 'Demand Side Management (DMS)' as applicable to energy management.
(9 marks)
- b) Despite the fact that there have been several programmes to promote DMS on energy, the uptake of DMS activities by the SME sector in Sri Lanka is rather slow. As you understand, identify and explain the major barriers to promote DMS in the SME sector in Sri Lanka, and suggest policy interventions at national level that you would recommend in order to remove these barriers.
(9 marks)

Q4.

- a) Explain the concept of "Energy Efficiency Benchmarking" as applied to the industrial sector, and identify the types of suitable energy performance indicator/s that can be used as Energy Efficiency Benchmark/s for an industry of your choice (i.e. select an industry you like).
(9 marks)
- b) Discuss the advantages and benefits that the industrialists can derive by using industry benchmarks for assessing their energy performance.
(9 marks)

Q5.

- a) Explain the role of an Energy Manager in an organisation.
(5 marks)
- b) Energy Manager's main task would be to TAKE CONTROL OF ENERGY USAGE in the organisation. Discuss in detail the actions and strategic moves the energy manager should take in achieving this objective.
(13 marks)

Q6.

- a) Discuss in detail the significance of excess air in fuel combustion and its implications on combustion efficiency. (9 marks)
- b) Identify and discuss the factors that contribute to high excess air levels in fuel combustion, and also describe the technological options available for controlling excess air. (9 marks)

_____END OF QUESTION PAPER_____