

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 | : MEX 7125 – ENERGY MANAGEMENT IN INDUSTRIES |
| Academic Year | : 2015/16 |
| Date | : 24 th November, 2016 |
| Time | : 0930 – 1230 hrs |
| Duration | : 3 hours |

General instructions

1. Read the questions carefully before answering.
2. Please note that you should write your registration number and your index number in each pages of your answer book. Do not write your name.
3. In case of doubt, please consult the supervisor or an invigilator conducting the examination.
4. Answer only five (05) questions. Question No 6 is compulsory.

Q1.

- a. Explain the term “Best Practices” as applied to energy efficiency. **(8 marks)**
- b. Discuss best practices that you would recommend to improve energy efficiency in air conditioning in a building. **(10 marks)**

Q2.

Write short notes on four of the following.

- a. Energy labelling
- b. Renewable energy
- c. Green House Gases
- d. Specific Energy Consumption
- e. Energy audit

(4.5 marks each)

Q3.

- a. Life styles and attitudinal behaviour of people are two key determinants of overall energy efficiency of a country. Discuss this statement critically. **(6 marks)**
- b. With respect to Sri Lanka, give a few practical examples of life styles and attitudinal behaviours of people that can have a positive impact on energy efficiency. **(12 marks)**

Q4.

- a. Explain the role of an Energy Manager in an organisation.

(6 marks)

- b. Discuss in detail the actions and strategic moves the energy manager in an industrial organisation should take in

- i) Taking Control of Energy Usage and
ii) Minimising Energy Cost of the organisation.

(12 marks)

Q5.

- a. What do you mean by “Energy Security” of a country?

(6 marks)

- b. Discuss the options available for improving long term energy security of Sri Lanka.

(12 marks)

Q6.

A manufacturing organisation in Sri Lanka uses two sources of energy – Electricity and Fuel Wood - for their operations.

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.

| Time Intervals | Energy Charge (LKR/kWh) | Fixed Charge (LKR/month) | Maximum Demand Charge per month (LKR/kVA) |
|----------------------------|-------------------------|--------------------------|---|
| Peak (18.30-22.30) hrs | 20.50 | 3,000 | 1,100 |
| Day (05.30-18.30) hrs | 11.00 | | |
| Off-peak (22.30-05.30) hrs | 6.85 | | |

Source: <http://www.ceb.lk/for-your-business/>

And

Cost of firewood is Rs. 4.50 per kg.

Answer the following questions.

- a. Calculate the total yearly energy cost of the organisation, giving separately the contribution from each source.

(10 marks)

- b. Calculate the share of each energy source of the total 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

Table 1: Electricity Consumption from National Grid

| Year | Month | kVA | kWh | | |
|------|-----------|-----|--------|--------|----------|
| | | | Peak | Day | Off Peak |
| 2015 | January | 139 | 9,772 | 30,140 | 18,565 |
| | February | 136 | 9,726 | 29,938 | 17,880 |
| | March | 148 | 11,233 | 34,557 | 22,098 |
| | April | 177 | 9,140 | 29,028 | 19,242 |
| | May | 176 | 9,885 | 29,794 | 18,908 |
| | June | 129 | 8,513 | 24,888 | 14,556 |
| | July | 140 | 9,025 | 26,860 | 16,770 |
| | August | 137 | 12,045 | 37,494 | 21,197 |
| | September | 168 | 9,883 | 31,201 | 20,012 |
| | October | 145 | 9,871 | 29,046 | 18,967 |
| | November | 160 | 11,279 | 37,779 | 24,237 |
| | December | 158 | 11,210 | 35,278 | 21,344 |

Table 2: Fuelwood consumption

| Year | Month | Consumption |
|------|-----------|-------------|
| | | kg |
| 2015 | January | 105,375 |
| | February | 89,437 |
| | March | 104,312 |
| | April | 102,625 |
| | May | 118,937 |
| | June | 103,562 |
| | July | 117,437 |
| | August | 98,937 |
| | September | 123,875 |
| | October | 138,875 |
| | November | 177,812 |
| | December | 178,000 |

ALL RIGHTS RESERVED