THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF ENGINEERING TECHNOLOGY
MASTER OF TECHNOLOGY IN INDUSTRIAL ENGINEERING – LEVEL07
FINAL EXAMINATION – 2011/2012
MEX7125 – ENERGY MANAGEMENT IN INDUSTRIES

DATE : 22 MARCH 2012
TIME : 1400-1700
DURATION : Three (03) hours

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. This paper consists of Six (06) questions. Answer only five (05) Questions. Question No. 01 is compulsory.

Q1. (Compulsory Question)

(i) Define Efficacy of an Electric Lamp and explain its significance in energy efficiency.

(ii) An industrial organisation has embarked upon a lighting efficiency improvement programme. Firstly, they concentrated on the security lighting of the factory premises. All security lights are switched on daily between 6.00pm and 6.00am (next day). A survey conducted on present security lighting system has collected following data and information.

Area covered by security lighting	Level of security required	Types of lamps used	Wattage per Lamp	Number
Northern side	Object identification not required. Any movement identification is sufficient.	Mercury Vapour Lamps	150	10
Eastern side	Some identification of object required.	Incandescent lamps	100	15
Southern side	Clear identification of objects required.	High Pressure Sodium Vapour Lamps	250	08
Western side	Vehicle park	Fluorescent Lamps	40	20

(a) Calculate the energy consumed by and energy cost for all security lighting per annum.
(b) Give your comments about the present security lighting system with respect to the selection of lamps for the particular duty and the performance of lamps with respect to energy efficiency.
(c) For the given duty requirements, propose a better way of selecting lamps with the objective of improving energy efficiency. Justify your selection of lamp/s for the intended purpose.
(d) Calculate the energy savings potential with the new proposal.

Following data are given.

The efficacies of common lamp types are given below.

Lamp type	Efficacy – Lumens/Watt	Colour Rendering Properties
Incandescent	17	Excellent
Halogen	22	Excellent
Fluorescent tube	90	Good
CFL	70	Good
Mercury vapour	60	Fair
Metal Halide	115	Fair
High Pressure Sodium	130	Poor
Low Pressure Sodium	150	Poor

Cost of electricity is Rs. 10.45/kWh

Any assumptions made must be clearly indicated.

(28 marks)

Q2.

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

(i) Excess air in fuel combustion
(ii) Energy labelling
(iii) Power factor correction
(iv) Energy efficiency indicators
(v) Greenhouse Effect

(18 marks)

Q3.

(i) Define the term 'Specific Energy Consumption'.

(ii) What are the benefits of establishing, monitoring and controlling specific energy consumption in a manufacturing organisation?.

(iii) Describe the competitive advantages the industrial sector could gain in the international market by improving their energy efficiency. You must take into consideration the current global business setting in answering this question.

(18 marks)

Q4.

(i) With respect to common industrial steam boilers, differentiate between 'Combustion Efficiency' and 'Boiler Efficiency'.

(ii) Identify and describe in detail the important factors/parameters and their influence on the combustion efficiency and the boiler efficiency.

(18 marks)

Q5.

(i) Explain the role of an Energy Manager in an organisation.

(ii) One of his main tasks 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.

(18 marks)

Q6.

Discuss the world trends and common strategic moves taken by nations in meeting the rising demand for commercial energy, amidst the declining fossil fuel resources and increasing environmental challenges due to the consumption of fossil fuels.

(18 marks)

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