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THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF ENGINEERING TECHNOLOGY
BACHELOR OF INDUSTRIAL STUDIES (INDUSTRIAL MANAGEMENT)
INDUSTRIAL ENERGY MANAGEMENT – MEI 5260
FINAL EXAMINATION 2010/2011

DATE : 28 MARCH 2011
TIME : 1400 Hrs -1700 Hrs
DURATION : THREE HOURS

ANSWER FIVE QUESTIONS ONLY. ALL QUESTIONS CARRY EQUAL MARKS

(1) Describe in detail the different sources of energy available, their advantages and disadvantages.

(20 marks)

(2) (i) "The heart of any steam power system is the boiler." Justify this statement and describe the main types of boilers in detail.

(10 marks)

(ii) How is the energy in steam converted into mechanical energy? Describe in detail two different machines used for this purpose.

(10 marks)

(3) (i) What are the responsibilities of an Energy Manager in a large organisation?

(10 marks)

(ii) Explain in detail how an energy audit may be planned and conducted.

(10 marks)

(4) Describe in detail how you would set up an Energy Management System in a manufacturing company using the basic principles of energy management.

(20 marks)

(5) (i) What are the basic financial components of an investment project?

(05 marks)

(ii) A factory invests Rs. 5,000,000 in power factor correction equipment and compact fluorescent lighting at the beginning of the year. Savings expected over 5 years are given in the table below. In the fourth year, further expenditure of Rs. 500,000 is expected for replacement of certain items.

Year	Saving (Rs.)
1	1,000,000
2	1,000,000
3	1,000.000
4	2,000,000
5	1,000,000

Find the NPV at the end of the 5th year if the discount rate is 11%.

(15 marks)

(6) (i) What are the energy inputs and outputs of a power plant engine?

(05 marks)

(ii) The following data are available for a power plant engine.

Fuel flow rate (kg/h) at 30° C	= 1,259.28
Air flow rate (kg/h) at 30° C	= 59,412
Electrical energy output (MJ/h)	= 19,584
Electrical power output (kW)	= 5,440
Energy input by fuel (MJ/h)	= 51,566
Generator efficiency (%)	= 96
Energy output of engine (MJ/h)	= 20,400

Determine:

(a) Engine efficiency
(b) Overall efficiency
(c) Specific fuel consumption

(15 marks)

(7) (i) How is waste energy classified, and how is energy recovered from the different ranges of waste energy?

(10 marks)

(ii) A waste steam condenser is used to preheat boiler feed water at the rate of 10,160 kg/hr from 30° C to 70° C. The specific heat of water is 4.187 kJ/kg° C and the latent heat of water is 2260 kJ/kg. How much steam is required per hour?

(10 marks)

(8) Explain the concept, implementation process and benefits of "Six Sigma."

(20 marks)

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