THE OPEN UNIVERSITY OF SRI LANKA

BACHELOR OF INDUSTRIAL STUDIES /

BACHELOR OF TECHNOLOGY

FINAL EXAMINATION – 2005 / 2006

TTX5234 PLANT UTILITIES

DURATION - THREE HOURS

051

DATE: 07ᵗʰ April 2006　　　　　　　**TIME: 09.30 – 12.30 HOURS**

Total Number of Questions = 10　Number of questions to be answered = 06

Answer the question 1, which is compulsory, and five (05) additional questions. Question 1 carries twenty five (25) marks and questions 2 to 10 carry fifteen (15) marks each.

01. Compulsory Question

a) State five (5) untimate sources of useful energy.　　　(02 Marks)

b) What do you understand by "Fractional Distillation"?　　　(01 Mark)

c) Sketch two different types of vertical axis wind turbines.　　　(02 Marks)

d) State four (4) different types of air compressors.　　　(02 Marks)

e) Why is it necessary to deaerate boiler feed water?　　　(02 Marks)

f) What is a Super Heater?　　　(02) Marks)

g) What is Luminous Efficiency?　　　(02 Marks)

h) State Lambert's cosine law of illumination.　　　(02 Marks)

i) What is Degree of Saturation?　　　(02 Marks)

j) Differentiate between Moisture Content and Moisture regain.　　　(02 Marks)

k) What do you understand by BOD(Biochemical Oxygen Demand)?　　　(02 Marks)

l) State four (4) physical water treatment processes.　　　(02 Marks)

m) What do you understand by an Accident?　　　(02 Marks)

02. a) What are Bioenergy Feedstocks?　　　(03 Marks)

　b) Explain different methods used to extract energy from biomass.　　　(12 Marks)

03. a) What is a Boiling Water Reactor?　　　(05 Marks)

　b) State and discuss the pros and cons of using nuclear power plants.　　　(10 Marks)

04. a) Explain with the aid of a suitable diagram the operational principle of a Water Tube Boiler.

(06 Marks)

b) Compare Water tube boilers with Fire tube boilers with respect to their suitability, advantages and disadvantages.

(06 Marks)

c) A water quantity of mass 'm' was heated from the temperature 't_1' to superheated steam at a temperature of 't_s'. Write down an expression for the enthalpy of superheated steam if saturation temperature = t_f, specific liquid enthalpy = h_f, specific enthalpy at evaporation = h_{fg} and specific heat of superheated vapour = c_p.

(03 Marks)

05. a) Describe the operational principle, advantages, disadvantages and suitable applications of standard incandescent lamps.

(08 Marks)

b) Explain the operational principle of an induction lamp and compare its features with those of an incandescent lamp.

(07 Marks)

06. a) State and explain all the factors to be considered in providing "Good Lighting" at a workplace.

(08 Marks)

b) Calculate the Mean Spherical Candle Power of an incandescent lamp of 2400 lumens total flux. If such a lamp is fitted at a height of 3 m above the centre of a working table of 3m x 4m dimensions, calculate the maximum and minimum illuminations to be found on the table.

(07 Marks)

07. a) Define the followimg terms:
  i. Humidity Ratio   ii. Relative humidity   iii. Adiabatic Saturation
  iv. Dew point temperature   (08Marks)

b) Draw the following processes in the psychrometric chart provided.
  i. Sensible heating   ii. Sensible cooling
  iii. Mixing of two sreams of humid air   iv. Spraying of hot water   (07 Marks)

08. Write an essay on "New Developments in Weaving Mill Air-conditioning" highlighting the problems to be faced with the introduction of high performance machines.   (15 Marks)

09. a) Distinguish between Aerobic Oxidation and Anaerobic Oxidation.   (05 Marks)

b) Write short notes on the following:
  i. Coagulation,   ii. Floatation iii Clarification
  iv. Activated Sludge Process   (10 Marks)

10. a) Discuss briefly the health hazards posed by

  i. Cotton Dust,   ii. Chlorine Dioxide.   (06 Marks)

b) List and explain the three cardinal rules of hazard control.   (09 Marks)

PSYCHROMETRIC CHART
NORMAL TEMPERATURES

SI METRIC UNITS

Barometric Pressure 101.325 kPa

SEA LEVEL

Enthalpy At Saturation kJ/kg Dry Air

Wet Bulb at Saturation Temperature °C

Enthalpy Deviation kJ/kg Dry Air

% Relative Humidity

Moisture Content kg/kg Dry Air