



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

**SECOND SEMESTER EXAMINATION FOR THE DEGREE OF MASTER OF
SCIENCE**

SET 601: ENERGY MANAGEMENT

DATE: Thursday 19th April 2012

TIME: 8.00a.m – 10.00a.m

*Instructions: This paper consist of Five(5) questions. Attempt
any 3 Questions. All questions carry equal marks as indicated.*

QUESTION 1

- (a) With an aid of a block diagram explain what energy management entails in terms of fuels, supply, energy conversion, utilization and wastes in production plants.
- (b) Take any one Case Study of the following energy conversion systems and explain how energy management can be put in place:
 - (i) Motor systems
 - (ii) Lighting systems
 - (iii) Heating systems, Ventilating and Air-Condition equipment systems
 - (iv) Steam systems
 - (v) Fired systems

QUESTION 2

- (a) In a heat treatment furnace, the exhaust gases are leaving the furnace at 1200°C at the rate of $2600\text{M}^3/\text{hour}$. Determine the total heat recoverable if the final exhaust flue gas is at 200°C . Assume that the density of the flue gas is 1.31 Kg/M^3 and the specific heat is $0.253\text{Kcal/Kg}^{\circ}\text{C}$.
- (b) Discuss what is involved in the following
 - (i) Maintenance of energy conversion systems
 - (ii) Process modification

QUESTION 3

- (a) Briefly discuss the following phrases in field of energy management systems:
 - (i) Heat loss reduction
 - (ii) Fuel-Air ratios
 - (iii) Waste Heat recovery
 - (iv) Recycling of waste materials
- (b) Cost of an heat exchanger is $\$2.5 \times 10^6$. Calculate simple payback period considering annual saving potential $\$80,000$ and annual operating cost of $\$20,000$

QUESTION 4

- (a) In your own understanding discuss the economic evaluation of energy conservation measures.
- (b) Explain what Benefit-Cost Analysis involved and in particular in depth your understand of the "Treatment of Uncertainty"

QUESTION 5

- (a) Explain the concept of three major "E's" in energy management
- (b) How would you carry out Energy Assessment?
- (c) Investment for an energy proposal is \$ 3.0×10^7 . Annual savings for the first three years is 180,000, 250,000 & 320,000. Considering cost of capital as 15%, what is the net present value of the proposal?