



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

SET 443: ENERGY ECONOMICS

DATE: Tuesday 6th December 2011

TIME: 11.00a.m -1.00p.m

INSTRUCTIONS

1. This paper contains five questions
2. Attempt any three questions
3. All questions carry equal marks
4. State assumptions made and define all symbols used

- Q1. a) What is energy economics and its importance to energy practitioners? [3 marks]
- b) In energy economics, it is crucial to distinguish different forms of energy resources in order to provide the best alternative energy source to energy consumers. Clearly distinguish between primary energy sources and secondary energy sources giving appropriate examples [5 marks]
- c) What is EROI and how is it measured? Describe why EROI is an important tool in energy ventures? [5 marks]
- d) Determine the annual profit required to ensure that Kshs 120,000/= will be available in 10 years time to replace a solar crop dryer if the return on investment is 20% [7 marks]
- Q2. a) Describe the concept of solar savings as used in energy economics [5 marks]
- b) Solar energy systems are known to have high initial capital costs and low operating costs. A solar heating system having an array of flat-plate collectors with an area of 60 sq-m is installed in a factory in Nairobi industrial area. It costs Kshs 300,000/= to set up with an initial down payment of 20% of the investment, the balance 80% being taken as loan to be repaid in equal annual installments over 10 year period at an interest of 16%. The cost of conventional fuel saved in the first year is Kshs 42,000/= and this cost increases at the rate of 4% every year. The annual expenditure required by way of maintenance, electrical

energy for running subsidiary equipments, local taxes and insurance is Kshs 13,200/= in the first year, and this expense increases at the rate of 5% every year.

The tax deductions are permissible only on depreciation, which is allowed at the rate of 25% each year and the company income tax rate is 55%. Assuming that the market discount rate is 10%, determine the cumulative solar savings [15 marks]

- Q3. a) In most African countries have not been able to industrialize like the Asia Tigers. As a brand new minister for energy and Energy Engineer what would you do to trigger economic development? (10 marks)
- b) Fuel costs are expected to inflate at the rate of 7% per year, and for the first year is Kshs 40000/= payable at end of the year. The market discount rate is 10% per year. What is the present worth of the payment to be made at the end of the third year? (10 marks)

- Q4. a) Most conventional energy sources are associated with environmental air pollution. As a fresh energy engineering graduate, you have been asked to undertake comprehensive studies to explain the processes that contribute to air pollution with the goal to minimize environmental air pollution. How would you go about undertaking this task? (10 marks)

- b) What is the undiscounted payback time B for USD11,000/= investment in solar powered equipment to which meets 56% of an annual load of 156GJ?. The first year cost is USD 8/=per GJ and is expected to discount future fuel costs at a rate of 8% per year. (10 marks)

- Q5. A plant energy engineer is trying to decide between two renewable energy power-generating machines presented in a table shown below:

Description	Machine A	Machine B
First costs (USD)	11,000	18,000
Annual operating costs	3,500	3,100
Salvage Value	1,000	2,000
Life, years	6	9

- a) Determine which one should be selected on the basis of present worth comparison using an interest rate of 15% per year (10 marks)
- b) If the study period of 5 years is specified and the salvage values are not expected to change, which alternative should be selected? (10 marks)