NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF BUILT ENVIRONMENT
BACHELOR OF QUANTITY SURVEYING (HONOURS) DEGREE
PART II FIRST SEMESTER EXAMINATIONS – JANUARY 2008

CONSTRUCTION ECONOMICS – AQS 2108

TIME: 3 Hours   **TOTAL MARKS:** 100

INSTRUCTIONS:

Answer Question **1** and any **3** others.

QUESTION 1

Daffstone Ltd, a construction company, has recently appointed a new managing director.
After completing a review of the company's machinery he reported to the Board of
Directors that the present machinery was out – of- date and incapable of sustaining high
production levels without frequent breakdowns, and that the quality of the quality of the
present production was poor.
The managing director proposed that the company should change to robotic machines.
The following information was available on the robots being considered for purchase.

1)	**Robot A** $Billion	**Robot B** $ Billion	**Robot C** $Billion
Purchase cost of machines	***10.00***	***9.00***	***15.50***
Estimated net cash inflows			
Year 1	***3***	***3***	***3***
Year 2	3.5	3	5
Year 3	4	3.5	6
Year 4	4	4	6

2) The company's cost of capital is 12%
3) Owing to their productive efficiency the robots would make the following number of
   manufacturing workers redundant:

	Robot A Number of workers	**Robot B** Number of workers	**Robot C** Number of workers
At end of Year 1	***50***	***50***	***50***
At end of Year 2	***60***	***60***	***80***

4) The construction workers' unions were opposed to the implementation of robotics, but in negotiations they had indicated that they would agree to the following: Redundant workers should each receive

(i) An amount equal to half a year's wages at the end of year in which they were made redundant, and

(ii) An additional flat rate terminal payment of $2,000,000 per worker
Note: the average annual wage is $6,000,000.

5) All estimated net cash inflows arise at the end of the relevant year.
The net cash inflows in (1) above do not take account of the redundancy payments.

Required

(a) i) Appropriate computations using the net present value and IRR methods for each of the robots being considered. **(12 marks)**

   ii) A report to the Board of Directors of Daffstone Ltd advising them as to which robot should be purchased, based on your results in (i) above **(5 marks)**

b) i) Give **four** factors which the directors should consider before reaching their final decision. **(4 marks)**

   ii) State two advantages and two disadvantages of using net present values **(4 marks)**

QUESTION 2

a) What is meant by
   i. Compounding
   ii. Discounting
   iii. Annuity
   iv. Opportunity Cost
   v. Sunk cost

(15 marks)

b) $20 000 000 is invested for five years and amounts to $62 400 000. Find correct to two decimal places, the annual interest rate if compound interest rate if compound interest is paid
   i. annually
   ii. quarterly

(10 marks)

QUESTION 3

a) Compare and contrast "free optimization" and "constrained optimization"

(5 marks)

b) A purely competitive firm has two factor inputs Labour (L) and Capital (K), with the wage rate (W) and the interest rate (R) per unit per period. The price of the product is P.
  i. Write the production function, revenue function, cost function, and profit function of the firm. **(2marks)**

  ii. Suppose the firm seeks to minimize its cost of production subject to producing a given level of output Q_0
    1. Write down the Lagrangian function to solve for the optimal levels of labour and capital employment. **(3marks)**

    2. State the three first-order conditions for solving the firm's optimization problem and derive the expression, which solves for the optimal quantities of L and K to be employed. **(8marks)**

    3. Give the economic interpretation of your solution in (2) **(7marks)**

QUESTION 4

a) Two- models of machines can be purchased to perform the same function. Type 1 has a low initial cost of $3 300 000 000, high operating costs of $900 000 000 per year, and a short life of 4 years. The more expensive type 11 costs $9 100 000 000, has annual operating expenses of $400 000 000, and can be kept in service economically for 8 years. The scrap value from either machine at the end of its life will barely cover its removal cost. Which is the preferred when the minimum attractive rate of return is 8 percent?

(13 marks)

b) An ambitious saver plans to deposit $2000 000 000 in a money – market account starting 1 year from now and wants to increase annual deposits by $ 1000 000 0000 each year for the next 6 years. Assuming that deposits earn 9% annually, determine what equal - payment annuity would accumulate the same amount over the 7 – year period.

(12 marks)

QUESTION 5

An engineering consulting firm won a contract to design and supervise construction of a sewage-treatment plant at a remote location. The installation phase will last at most 2 years, and two engineers from the firm will supervise on-site operations. They will need both living accommodations and an office. Three alternatives are available, with the costs shown below:

1. Rent a building with furnished living accommodations and an office: $3000 per month including upkeep and utilities.
2. Buy two furnished trailers to live and rent an office: The purchase price of a house trailer is $24,000 per trailer (the seller will buy back a used trailer for 40 percent of its purchase price any time within 2 years); trailer upkeep, site rental, and utilities are $200 per trailer per month; and office rental is $800 per month.
3. Buy three trailers: Two house trailers as in alternative 2 and a smaller one to serve as an office, purchased for $16000 from the same seller.

If all the alternatives provide adequate facilities, which one do you recommend?

(25 marks)

QUESTION 6

Life costing is theoretically sound but in practice can seldom be justified because of the inherently unstable economic environment in which most building owners operate in Zimbabwe. Discuss **(25 marks)**

END OF EXAMINATION