



MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

FOURTH YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECU 402: ENGINEERING ECONOMICS

DATE: 1/8/2019

TIME: 8.30-10.30 AM

INSTRUCTIONS

Answer question ONE and any other two questions

QUESTION ONE (30 MARKS)

- a) Optimizing a design with respect to cost is a four-step process. Outline the steps. (7 marks)
- b) Mrs. Mwangi will need KES 1,500,000 in five years to pay for a major overhaul on her tractor engine. She has found an investment that will provide a 7% return on her invested funds. How much does Betty need to invest today so she will have her overhaul funds in five years? (5 marks)
- c) Enumerate various situations in which engineering economics can play a role. (8 marks)
- d) A friend of yours bought a small apartment building for \$100,000 in a college town. She spent \$10,000 of her own money for the building and obtained a mortgage from a local bank for the remaining \$90,000. The annual mortgage payment to the bank is \$10,500. Your friend also expects that annual maintenance on the building and grounds will be \$15,000. There are four apartments (two bedrooms each) in the building that can each be rented for \$360 per month.

Required:

- i) Does your friend have a problem? If so, what is it? (2 marks)
- ii) What are her alternatives? (Identify at least three.) (3 marks)
- iii) Estimate the economic consequences and other required data for the alternatives in Part(b) (5 marks)

QUESTION TWO (20 MARKS)

- a) Discuss the different methods used to evaluate alternative projects. (10 marks)
- b) A cell phone company has a fixed cost of \$1,500,000 per month and a variable cost of \$20 per month per subscriber. The company charges \$39.95 per month to its cell phone customers.
 - i) What is the breakeven point for this company? (3 marks)
 - ii) The company currently has 73,000 subscribers and proposes to raise its monthly fees to \$49.95 to cover add-on features such as text messaging , song downloads, game playing and video watching. What is the new breakeven point if the variable cost increases to \$25 per customer per month? (3 marks)
 - iii) If 10,000 subscribers will drop their service because of the monthly fee increase in Part (b), will the company still be profitable? (4 marks)

QUESTION THREE (20 MARKS)

Assume a project costs shs 30,000 and yields the following uncertain cashflows:

Year	Cash flow
1	12,000
2	14,000
3	10,000
4	6,000

Assume also that the certainty equivalent co-efficients have been estimated as follows

a_0	=	1.00
a_1	=	0.90
a_2	=	0.70
a_3	=	0.50
a_4	=	0.30

The risk-free discount rate is given as 10%

Required:

Compute the NPV of the project

QUESTION FOUR (20 MARKS)

- a) The following data has been developed for Crown Company, the manufacturer of an advanced line of adhesive:

State of nature	Probability	Market Return R_m	Return for the firm R_j
1	0.1	-0.15	-0.30
2	0.3	0.05	0.00
3	0.4	0.15	0.20
4	0.2	0.20	0.50

The risk free rate is 6%. Find:

- i) The expected market return $E(R_m)$ (3 marks)
 - ii) The variance of the market return $\sigma^2(R_m)$ (3 marks)
 - iii) The expected return for Crown Company $E(R_1)$ (3 marks)
 - iv) Given that $\text{cov}(R_j, R_m) = 0.0215$, find B_j (3 marks)
 - v) Using the above information state the CAPM (3 marks)
 - vi) What is required for Crown Company? How does it compare with its expected return? (3 marks)
- b) Clearly distinguish between ordinary annuity and annuity due (2 marks)

QUESTION FIVE (20 MARKS)

- a) Given that $i = 10\%$ Show that
 $FVIFAND_{i,4} = [FVIF_{i,3} + FVIF_{i,2} + FVIF_{i,1} + FVIF_{i,0}] (1+i)$ without using tables. (10 marks)
- b) When valuing a firm, it's important to describe the business entity under consideration. Discuss the three important aspects that help describe a business entity (10 marks)