



KENYATTA UNIVERSITY
EXAMINATION FOR THE DEGREE OF BACHELOR OF ENGINEERING
ECU 401: ENGINEERING PROJECT MANAGEMENT
1ST SEMESTER 2025/2026 **TIME: 2 HOURS**

INSTRUCTIONS: THIS PAPER CONTAINS FIVE QUESTIONS. ATTEMPT QUESTION ONE AND ANY OTHER TWO QUESTIONS.

QUESTION ONE (30 MARKS)

(a) Define the following terms as applied to Project Management for engineers:

- i. A project (1 mark)
- ii. Tendering and Procurement (1 mark)
- iii. A Contract (1 mark)
- iv. Environmental, Social and Safety (1 mark)
- v. Prefeasibility and Feasibility Studies (1 mark)

(b) State six characteristics that differentiate a project from any other activity in a business.

(3 marks)

(c) Explain, with the help of schematic graphs two life cycle-path that depicts majority of engineering projects. Give typical examples in each case.

(4 marks)

(d) The faculty of engineering wishes to conduct a feasibility study for replacement of its machinery.

Discuss key areas of focus that would be considered under such a study. (6 marks)

(e) A small maintenance project consists of the jobs as outlined in the table below:

- i. Determine the critical path.
- ii. Duration of the project.
- iii. Determine the normal cost of the project.
- iv. Determine the total cost of crashing the project by 2 days.

(12 marks)

Activity	t_o	t_m	t_p	t_e	Normal cost	Minimum (crash) duration	Incremental cost KSh/day
1-2	1	1	7		18,000	1	2,000
1-3	1	4	7		10,000	2	2,500
1-4	2	2	8		25,000	2	3,000
2-5	1	1	1		8,000		
3-5	2	5	14		10,000	4	1,500
4-6	2	5	8		12,000	4	4,000
5-6	3	6	15		25,000	6	1,000

QUESTION TWO (20 Marks)

- (a) Outline the key elements that constitute estimated cost of an activity of a project (10 marks)
- (b) Outline the steps involved in decision-making process (10 marks)

QUESTION THREE (20 Marks)

- a) Define the following terms as applied to project management:
- Discounted cash flow (1 mark)
 - Net Present Value (1 mark)
 - Profitability Index (1 mark)
 - Internal Rate of Return (1 mark)
 - Risk (1 mark)
 - Uncertainty (1 mark)
- b) The school of engineering, Kenyatta University is considering an investment of KES 300,000 in an asset with a useful life of five years. The school estimates that the annual cash revenues and expenses will be KES140,000 and KES 40,000, respectively. The annual depreciation based on historical cost will be KES 60,000. The required rate of return on a project of this risk is 13%. The marginal tax rate is 34%. The 13% required rate of return is a nominal required return including inflation.
- What is the NPV of this project? (6 marks)
 - Suppose the School has forgotten that revenues and expenses are likely to increase with inflation at a 5% annual rate. Recalculate the NPV. Is this a more attractive proposal now that inflation has been considered? (8 marks)

QUESTION FOUR (20 Marks)

- Describe the four essential elements of a valid construction contract and briefly explain their importance in contract formation (4 marks)
- State four grounds for fair dismissal under employment law as applied in construction labour relations (4 marks)
- Explain the concepts of express and implied terms in construction employment contracts.

(4 marks)

- d) A road project is tendered using a Bill of Quantities (BOQ) contract. The following items were measured during construction:

Item	BOQ Quantity	Actual Quantity	Rate (KES)
Excavation	8,000 m ³	7,200 m ³	450
Gravel base	5,000 m ³	5,900 m ³	1,200
Culverts	40 No.	36 No.	28,000

- Compute the adjusted contract price based on actual quantities. (5 marks)
- Explain why BOQ-based contracts require re-measurement and how this affects contractor risk allocation. (3 marks)

QUESTION FIVE (20 Marks)

The World Light Company produces two light fixtures (products 1 and 2) that require both metal frame parts and electrical components. Management wants to determine how many units of each product to produce so as to maximize profit. For each unit of product 1, 1 unit of frame parts and 2 units of electrical components are required. For each unit of product 2, 3 units of frame parts and 2 units of electrical components are required. The company has 200 units of frame parts and 300 units of electrical components. Each unit of product 1 gives a profit of KSh1, and each unit of product 2, up to 60 units, gives a profit of KSh2. Any excess over 60 units of product 2 brings no profit, so such an excess has been ruled out.

- Formulate a linear programming model for this problem. (6 marks)
- Use the graphical method to solve this model. What is the resulting total profit? (14 marks)