KISII UNIVERSITY
UNIVERSITY EXAMINATIONS
DBAD 0171/ DBAD 0226/ DPRS 0170 : QUANTITATIVE METHODS

INSTRUCTIONS
Do not write anything on this question paper
Answer question ONE (compulsory) and any other THREE

QUESTION ONE

a) Define the following term as used in set theory. [4 marks]
   i. Union of two sets A and B
   ii. Intersection of two sets A and B.
   iii. Universal sets
   iv. A null set

b) Solve for x in the equation:

$$\frac{X}{3} = y - \frac{4}{3}$$

$$2x - 5y = -7$$ [3 marks]

c) Find the derivatives of
   i. $y = 3x^2 + 5x + 7$ [3 marks]
   ii. $y = 4x^2 - 2x^b$ [3 marks]

d) Three machines, A, B and C, produce respectively 60%, 30% and 10% of the total production of a factory. The percentages of defective production for each machine are respectively 2%, 4% and 6%.
   (i) If an item is selected at random, find the probability that the item is defective.[3mks]

   (ii) If an item is selected at random and found to be defective, what is the probability that the item was produced by machine A? [3 marks]

e) In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there? [6 marks]

QUESTION TWO

a) $\int x^2 dx$ [3 marks]

b) $\int x^{-5/2} dx$ [2 marks]

c) The weekly revenue Sh. R of a small company is given by

$R = 14 + 81x - \frac{x^3}{12}$ Where x is the number of units produced.

Required
   i. Determine the number of units that maximize the revenue [5 marks]
   ii. Determine the maximum revenue [3 marks]

iii. Determine the price per unit that will maximize revenue [2 marks]

QUESTION THREE

A company is considering two mutually exclusive projects requiring an initial cash outlay of Sh 10,000 each and with a useful life of 5 years. The company required rate of return is 10% and the appropriate corporate tax rate is 30%. The projects will be depreciated on a straight line basis. The before depreciation and taxes cashflows expected to be generated by the projects are as follows.

YEAR	1	2	3	4	5
Project A	Shs 4,000	4,000	4,000	4,000	4,000
Project B	Shs 6,000	1,000	4,000	6,000	7,000

Required:

Calculate for each project

i. The payback period [5 marks]

ii. The net present value [10 marks]

QUESTION FOUR

a) Your company manufactures large scale units. It has been shown that the marginal (or variable) cost, which is the gradient of the total cost curve, is (92 – 2x) Shs. thousands, where x is the number of units of output per annum. The fixed costs are Shs. 800,000 per annum. It has also been shown that the marginal revenue which is the gradient of the total revenue is (112 + 2x) Shs. thousands.

Required

i. Establish by integration the equation of the total cost curve (2 Marks)
ii. Establish by integration the equation of the total revenue curve (2 Marks)
iii. Establish the break even situation for your company (2 Marks)
iv. Determine the number of units of output that would
   a) Maximize the total revenue and (3 Marks)
   b) Maximize the total costs, together with the maximum total revenue and total costs (3 Marks)

b) A cost function is

$$Ksh.(c) = Q^2 - 30Q + 200$$

Where Q = quantity of units produced

Find the point of minimum cost. Explain your answer. (5 Marks)

QUESTION FIVE

a) Define a matrix (2 marks)

b) Find A^2 in $\begin{pmatrix} 2 & 8 & 2 \\ 1 & 2 & -2 \end{pmatrix}$ (4 marks)

3 4 -6

c) Find the inverse of the matrix below :

(5 marks)

$$\begin{pmatrix} 2 & 8 & 2 \\ 1 & 2 & -2 \\ 3 & 4 & -6 \end{pmatrix}$$

d)Solve the following simultaneous equations using matrix method (4 marks)

$4x + 2y=8$

$3x + y=5$

QUESTION SIX

a) Use the sets provided below to answer the following questions:

A= {1, 2, 3, 6, 7}
B= {2, 3, 1}
C= {9, 1, 2, 3}
D= {2,3, 4, 5}
E= {1, 3,2, 4, 5, 6, 7, 8, 9}

(i) Union of the above sets (2 marks)
(ii) Intersection of two sets A , B, C and D (2 marks)
(iii) Which of the above sets is a universal set? (1 mark)
(iv) B^c with reference to set E (2 marks)

b) In a class of 200 students, an examination was done for three subjects, that is, English, Mathematics and Chemistry. 60 candidates did English, 80 mathematics and 55 chemistry. If 20 did mathematics and English, 16 English and chemistry, 27 did mathematics and chemistry and 10 did all the three subjects.

Required:

(i) Present the above information in a venn diagram (4 marks)
(ii) The number of candidates in total who did all the three subjects (2marks)
(iii) The number of students who did none of the three subjects (2 marks)