



- b) i) Define the term a mapping as used in set theory given two sets A and B and that  $x \in A$ ,  $y \in B$ . (2mks)
- ii) Let  $f(x) = 2x + 1$  and  $g(x) = x^2 + 2$ . Find the values of  $f \circ g(3)$  and  $g \circ f(3)$ . (4mks)
- c) Let Q be the set of rational numbers. Let the function  $f: Q \rightarrow Q$  defined by  $f(x) = 2x + 7$ . Find
- i)  $f^{-1}(x)$  (3mks)
- ii)  $f^{-1}(1)$  (2mks)
- d) Let  $f: Q \rightarrow Q$  be defined by  $f(x) = 4x + 3$ ,  $x \in Q$ . Show that f is 1-1 function (3mks)

**QUESTION THREE (20MARKS)**

- a) Given two sets,  $A = \{a, b, c, k, p, q, r, s\}$  and  $B = \{b, k, q, m, n, o, t\}$ , find
- i)  $A - B$  (1mk)
- ii)  $B - A$  (1mk)
- iii)  $A \oplus B$  (2mks)
- iv) With the help of Venn diagram, illustrate  $A \oplus B$ , indicating clearly the elements in the respective sets. (3mks)
- v) Prove that  $\sqrt{2}$  is not rational (5mks)
- b) Given that  $\sqrt{37} = 6.0838$  and  $\sqrt{35} = 5.9161$ . Evaluate without using tables or calculators

$$\frac{1}{(\sqrt{37} - \sqrt{35})} \quad (4mks)$$

- c) Solve the simultaneous equations

$$\begin{aligned} xy &= 160 \\ \log x - 3\log y &= 1, \text{ for } x > 0, y > 0 \end{aligned} \quad (4mks)$$

**QUESTION FOUR (20 MARKS)**

- a) Define the following terms
- i) A sequence of terms (1mk)
- ii) An Arithmetic Progression (2mks)
- b) In an A.P, the 4<sup>th</sup> term is 13 and the 7<sup>th</sup> term is 22. Determine
- i) The first term and common difference (3mks)
- ii) The value of n if the n<sup>th</sup> term is 100 (4mks)
- iii) The value of m if the sum to m terms of the series is 175 (4mks)
- c) A supplier in a company makes a single deposit of ksh.32, 000 in an account which pays compound interest at a rate of 4% P.a.

- i) How much is the investment worth after 12years (3mks)
- ii) After how many years will the investment be worth 3 times its initial value? (3mks)

**QUESTION FIVE (20MARKS)**

- a) Differentiate between combination and permutation of the elements of a set (2mks)
- b) A museum has 7 paintings to hang and 3 vacant locations, each of which will hold one painting. In how many different ways can these 3 locations be filled by the paintings? (2mks)
- c) Fifteen people entered a talent contest. The top 3 contestants will each win Ksh.1million and everyone else will get an honorable mention.
  - i) In how many different ways can 3 winners be chosen? (2mks)
  - ii) In how many different ways can 12 people be chosen for honorable mention? (2mks)
- d) i) Give an expression for the  $r^{\text{th}}$  term in a binomial theorem for the expansion of any binomial  $(a+b)^n$ , where n is a positive integer. (2mks)
- ii) Approximate the value of  $(1.015)^{20}$  by using the first two terms of a binomial expansion (2mks)

e) The data below represents the number of points scored by different table tennis players in a tournament.

Points	20-29	30-39	40-49	50-59	60-69	70-79	80-89
Players	2	3	9	14	17	4	1

Using an appropriate assumed mean, estimate

- i) The mean (4mks)
- ii) The median(2mks)
- iii) The standard deviation (2mks)