Candidate's Index Number:
Signature:

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
SCHOOL OF EDUCATIONAL DEVELOPMENT AND OUTREACH
INSTITUTE OF EDUCATION

COLLEGES OF EDUCATION
FOUR-YEAR BACHELOR OF EDUCATION (B.ED)
FIRST YEAR, END-OF-FIRST SEMESTER EXAMINATION, MARCH, 2021

MARCH 30, 2021   **COLLEGE ALGEBRA**   **2:30 PM – 4:00 PM**

SECTION B
(60 MARKS)

Answer any THREE questions from this Section. Show working(s) clearly for each question.

1.

   a. i. Write down the binomial expansion of $(1 + x)^4$.   **[2 marks]**

       ii. Use the result in (i) to evaluate $\left(\dfrac{5}{4}\right)^4$, correct to three decimal places.   **[4 marks]**

   b. There are 115 members in a club. Out of this number, 95 own a house or a car or a business, 30 club members own a house, 70 own a car and 23 own a business. It is known that 15 own both a car and a business; 12 own both a house and a business; and 13 own both a car and a house. Only x club members had a business, a car and a house.

       i. Represent the information on a Venn diagram.

       ii. Use the Venn diagram to calculate the number of club members who own:

           α_1) a car, a business and a house;

           α_2) a car only;

           α_3) a house only;

           α_4) exactly two of the properties.   **[14 marks]**

2.

a. i. The houses along a street in a certain city are assigned odd numbers, starting from 3. If the last house is numbered 147. Find the number of houses on that street? **[4 marks]**

iii. The arrangement of seats in a large auditorium is such that there are 9 seats in the first row, 12 seats in the second row, 15 seats in the third, and so on.

α_1) If there are altogether 25 rows in the auditorium, how many seats will be in the 25th row? **[4 marks]**

α_2) What is the total number of seats in the auditorium? **[5 marks]**

b. Determine the values of p and q such that $\dfrac{\sqrt{5}+4}{3-2\sqrt{5}} - \dfrac{2+\sqrt{5}}{4-2\sqrt{5}} = p+q\sqrt{5}$. **[7 marks]**

3.

a. i. When the polynomial $f(x) = x^3 - px^2 + qx + 2$, where p, q are constants, is divided by $(x-2)$, the remainder is 2. When divided by $(x+1)$, the remainder is -10.

α_1) Find the values of p and q.

α_2) Hence, find $f(3)$. **[10 marks]**

b. A carpenter can make at most 20 tables and at most 30 chairs per day. Each table requires 3 hours of labour and each chair 2 hours of labour. The maximum total number of hours of labour that the carpenter has at his disposal is 96 hours.

i. Give **three** inequalities that express the conditions above.

ii. Graph and shade the common region that satisfies these inequalities. **[10 marks]**

4.

a. A binary operation, * is defined on the set R, of real numbers by $p * q = p + q + \sqrt{2}$, where $p, q \in R$.

i. Determine whether or not * is associative. **[4 marks]**

ii. Find the:
α_1) neutral element, e of R under * ;
α_2) inverse of p;
α_3) inverse of $3\sqrt{2}$. **[6 marks]**

b. The first, second and fifth terms of a linear sequence are three consecutive terms of an exponential sequence. If the first term of the linear sequence is 14, find the common:
i. difference of the linear sequence;
ii. ratio of the exponential sequence. **[10 marks]**