The University of the State of New York

EXAMINATION FOR QUALIFYING CERTIFICATES

ADVANCED ALGEBRA

Monday, September 12, 1927 — 1.15 to 4.15 p. m., only

Answer eight questions. Each answer should be reduced to its simplest form. Papers entitled to less than 75 credits will not be accepted.

1 *a* Form an equation of the fourth degree whose coefficients are rational and two of whose roots are $2+\sqrt{3}$ and $1-2\sqrt{-1}$. [7½]

b Find graphically the sum of $-3+\sqrt{-3}$ and $4+2\sqrt{-1}$. [5]

2 *a* Transform the equation $x^3-6x^2+12x+19=0$ into one lacking the second term. [6]

b Solve the equation obtained in answer to *a* and from the roots determine the roots of the given equation. [6½]

3 Find by the use of logarithms the length in feet of one side of the smallest cubic bin that contains 82.5 bushels. [A bushel contains 2150.4 + cubic inches.] [12½]

4 Using Horner's method, find to *one* decimal place the negative root of the equation $3x^3-10x^2-7x+30=0$ [12½]

5 A certain number was to be added to ½ but by mistake ½ was divided by the number. However, the correct result was obtained. Find the number. [12½]

6 *a* Write the formula for the general term in a binomial expansion. [5]

b Using the formula given in answer to *a*, find the *sixth* term of $(2a-3a^{-1})^8$. [7½]

7 *a* In a certain year the membership of a high school society consisted of 8 girls and 10 boys, the president being a boy. In how many ways could a committee of 5 consisting of 2 girls and 3 boys be formed if the president was a member of the committee? [6½]

b Five people apply for a position. How many possible arrangements of their names in a list are there? How many times will a particular person head the list? [3, 3]

8 Find the value of the repeating decimal 2.3636 . . . [12½]

9 *a* Given the equation $x^4-3x^3-x^2-7=0$; without solving, determine the number of negative roots, the number of positive roots and the number of imaginary roots. [2, 2, 2]

b Transform the equation $2x^4-3x^3+5x^2-4x+6=0$ into an equation having integral coefficients, the coefficient of x^4 being unity. [6½]

10 A man traveled 78 miles by automobile at a certain average rate of speed. On his return he increased his average speed 4 miles an hour and made the trip in 24 minutes less time. Find his average rate of speed on the return trip. [12½]

11 *a* Plot the graph of the equation $3x^3-23x^2+60x-50=y$ for values of x from 0 to 5 inclusive. [10]

b Determine from the graph the nature of the roots of the equation $3x^3-23x^2+60x-50=0$ [2½]