The University of the State of New York

223D HIGH SCHOOL EXAMINATION

ADVANCED ALGEBRA

Monday, June 14, 1920—9.15 a. m. to 12.15 p. m., only

Write at top of first page of answer paper (*a*) name of school where you have studied, (*b*) number of weeks and recitations a week in (1) elementary algebra, (2) intermediate algebra, (3) advanced algebra.

The minimum time requirement is five recitations a week in algebra for two school years.

Answer eight questions, including two from group I, four from group II and two from group III. Each answer should be reduced to it simplest form.

Credits: Group I, 10 each; group II, 15 each; group III, 10 each.

Group I

Answer two questions from this group.

1 Solve and check:

$$\frac{x}{x-5}-\frac{x-5}{x}=\frac{3}{2}$$

2 For what values of m will the equation $\frac{x^2-x+m-1}{(x-1)(m-1)}=\frac{x}{m}$ have two equal values for x?

3 *a* Rationalize the denominator of $\frac{x-\sqrt{x^2-1}}{x+\sqrt{x^2-1}}$

b Find the value of this expression when $x=4$, evaluating the radical to the *nearest* hundredth.

Group II

Answer four questions from this group.

4 Find by formula the sum of the first 6 terms of the progression $2\frac{2}{3}$, $3\frac{1}{2}$, $4\frac{4}{15}$ . . .

Or

Using logarithms, find the value of n in the formula $n=\frac{1}{2L}\sqrt{\frac{Mg}{m}}$ when $L=78.5$, $M=5468$, $g=980$, $m=0.0065$.

5 Find all the roots of $x^4+x^3-2x^2+4x-24=0$. Check by forming the product of the roots and comparing it with the proper term in the equation.

6 Given the equation $3x^3-x^2-5=0$

a Write the sum of the roots and the product of the roots.

b Transform to an equation whose roots are twice the roots of the given equation.

c Transform to an equation with integral coefficients, the coefficient of the highest degree term being unity.

7 *a* Plot the graph of x^3-7x+6 from $x=-4$ to $x=+4$

b What is the greatest value of this expression for values of x between -4 and $+3$?

c From the graph determine the roots of the equation $x^3-7x+6=0$

8 Find to the *nearest* hundredth the root of the equation $x^3+3x^2-4x-1=0$, which lies between 1 and 2.

Group III

Answer two questions from this group.

9 *a* Draw the graph of *each* of the following and of their sum: $3+\sqrt{-2}$, $3-\sqrt{-2}$

b In the expression $1+ix+\frac{i^2x^2}{2}+\frac{i^3x^3}{3!}$ $x=2$ and $i=\sqrt{-1}$. Find the value of this expression. [$n!$ = factorial n]

10 In a league of 10 basket ball teams each team plays two games with every other team. How many weeks will the playing season last if three games are played each week? How many times will any one team play?

11 A formula for the flow of water in a long horizontal pipe connected with the bottom of a reservoir is

$$\frac{Hd}{L}=\frac{4v^2+5v-2}{1200}$$

when H is the depth of the water in the reservoir in feet, d the diameter of the pipe in inches, L the length of the pipe in feet and v the velocity of the water in feet per second. If a reservoir contains 49 feet of water, find the velocity of the water in a 5 inch pipe that is 1000 feet long.

12 The so-called effective area of a chimney is given by the formula $E=A-\frac{3}{5}\sqrt{A}$ when A is the measured area. Solve this equation for A in terms of E.

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DIRECTIONS FOR RATING

The direction, "Less than 60% of the credit should be granted when an error in computation occurs," should be followed in rating all incorrect answers to questions which fall under the topics mentioned in "Suggestions on the Rating of Regents Examination Papers in Mathematics" under "General 3."

Except in schools where the "committee system" is used, teachers are urged to mark papers cumulatively, that is, to add the credits earned by each answer to the total credits earned by preceding answers so that the mark given to the last answer is the per cent to which the paper is entitled, e. g. consecutive answers earning 5, 7, 4 etc. respectively should be marked 5, 12, 16 etc. respectively.

1 10 credits

Allow 5 credits for correct solution and 5 credits for correct check.

2 10 credits

Allow 2 credits for correct expression as a quadratic in x.

Allow 8 credits for correctly determining the values of m.

3 10 credits

a 5 credits. Allow no partial credit.

b 5 credits

4 15 credits

Allow 6 credits for correct formula and substitution and 9 credits for correct solution.

Or

15 credits. See General Suggestion 3.

5 15 credits

Allow 10 credits for finding the real roots (5 each).

Allow 2 credits for finding the imaginary roots (1 each).

Allow 3 credits for check.

DIRECTIONS FOR RATING—*concluded*

6 15 credits

a 4 credits. Allow no partial credit.

b 5 credits

c 6 credits

7 15 credits

a 9 credits

b 3 credits

c 3 credits

8 15 credits

Allow 3 credits for determining tenth's place.

Allow 8 credits for determining hundredth's place.

Allow 4 credits for determining if "nearest hundredth" should be one more.

9 10 credits

a Allow 6 credits (2 each).

b Allow 4 credits.

10 10 credits

Allow 7 credits for finding the number of weeks.

Allow 3 credits for finding the number of times each team will play.

11 10 credits

12 10 credits