The University of the State of New York

EXAMINATION FOR QUALIFYING CERTIFICATES

PLANE TRIGONOMETRY

Wednesday, September 15, 1926—9.15 a. m. to 12.15 p. m., only

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Answer seven questions, including three from group I and four from group II. Papers entitled to less than 75 credits will not be accepted.

A, B and C represent the angles of a triangle ABC; a, b and c represent the respective opposite sides. In a right triangle, C represents the right angle.

Give special attention to neatness and arrangement of work.

Group I

Answer three questions from this group.

1 In a right triangle given $A = 73^\circ\ 42'\ 30''$, $a = 6.432$; find the area of the triangle. [16]

2 Given $a = 31.725$, $b = 49.085$, $C = 28^\circ\ 20'$; find A and B. [16]

3 From the roof of a house 45 feet high the angle of elevation of the top of a chimney across a level street is found to be $40^\circ\ 40'$ and the angle of depression of the base of the chimney, which is on a level with the street, is $36^\circ\ 20'$; find the height of the chimney. [16]

4 To find the distance between two points, A and B, A being accessible and B being inaccessible, a distance AC equal to 100 feet is measured. Angles CAB and ACB are then measured and found to be $40^\circ\ 50'$ and $65^\circ\ 28'$ respectively. From these measurements compute the distance from A to B. [16]

Group II

Answer four questions from this group.

5 *a* Starting with the formula for $\cos(x+y)$, derive the formula $\cos 3x = 4\cos^3 x - 3\cos x$. [7]

b Starting with the formula for $\cos 2x$, derive the formula

$$\tan \tfrac{1}{2}x = \sqrt{\frac{1-\cos x}{1+\cos x}} \qquad [6]$$

6 Draw a unit circle and in it represent the four quadrants and an angle in each quadrant. For each angle give a line representation of *each* of the following functions: sine, cosine, tangent, cotangent. [13]

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7 *a* Prove the following identity:

$$\tan(45^\circ + A) - \tan(45^\circ - A) = 2\tan 2A \qquad [6]$$

b Find the value of the positive acute angle m which satisfies the equation $m = \tan^{-1}\frac{1}{2} + \tan^{-1}\frac{1}{3}$ [7]

8 Solve the following equation for all values of x between 0° and 360°:

$$12\cos^2 x + 4\sin x - 11 = 0 \qquad [13]$$

9 *a* Without the use of tables find the value of

$$\sin 210^\circ;\ \tan\frac{4\pi}{3};\ \sec(-300^\circ) \qquad [2, 2, 2]$$

b If $\log\sec A = .08713$, find A. [4]

c How many degrees are there in 1.5 radians? [3]