Monday, June 15, 1914 — 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 solid geometry. The minimum time requirement is two recitations a week for a school year or four recitations a week for half a school year.

Name the author of the textbook you have used in your study of solid geometry.

Answer seven questions, selecting three from group I and two from each of the other two groups.

Assign 12 credits to each question in group I and 16 credits to each question in groups II and III.

Group I

1. Prove that if a straight line is perpendicular to each of two lines at their point of intersection, it is perpendicular to the plane of those lines.

2. Prove that a section of a circular cone made by a plane parallel to the base is a circle.

3. Prove that in two polar triangles each angle of the one is the supplement of the opposite side in the other.

4. Prove that the volume of a triangular pyramid is equal to one third the product of its base by its altitude.

Group II

5. Prove that if a plane and a line not lying in it are both perpendicular to the same plane, they are parallel.

6. Different cylinders are generated by the rotation of a rectangle about its side, according as it rotates about the longer or the shorter side. Prove that the curved surfaces generated in the two cases are equal.

7. Answer the following without figures or proof:

What is the locus of points (a) equidistant from two parallel planes, (b) equidistant from two intersecting planes, (c) equidistant from three points not in the same straight line, (d) equidistant from three planes meeting in a point, (e) equidistant from three nonparallel planes which are perpendicular to the same plane, (f) at a given distance from a given spherical surface, (g) at a given distance from a given line segment, (h) at a given distance from a given unlimited straight line?
Group III

8 Assuming that the earth is a sphere, prove that one half the earth’s surface is included between the parallels 30° N. and 30° S. latitude.

9 a At 1 1/2 cents per sq. ft, what will it cost to paint the inside of an open cistern having the form of a frustum of a cone of revolution whose depth is 7 ft, whose top diameter is 3 ft and bottom diameter 6 ft?

b How many gallons of water will the cistern hold if a cubic foot of water contains 7 1/2 gallons?

10 If the slant height of a cone of revolution is 18’, find the parts into which the slant height is divided by a plane which is parallel to the base and which divides the convex surface in the ratio of 3:5.