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MADRAS RECORD OFFICE.

Government of Madras.

Public Works DEPARTMENT.

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Dated	19-6-63.	18 63.

Not to be folded or roughly handled

2/11/63

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*Proceedings of the Madras Government, Public Works Department,
19th June 1863.*

No. 444. Read the following letter from Lieutenant C. BOWERS, R. E., for Acting Principal Civil Engineering College, to Colonel W. I. BIRDWOOD, R. E., Secretary to Government, Department Public Works, dated Chepauk, 9th June 1863, No. 127 :—

SIR,

1. I have the honor to forward copies of examination papers set for the Students of the 1st and 2nd Departments and Special Survey and Drawing classes of the Civil Engineering College, who have been examined this year for certificates of qualification as Assistant Overseers, Surveyors, and Estimators and Draughtsmen, that you may see the style of education they have had, and their attainments as per detailed statements of the results of the examination enclosed for your information.

2. A nominal roll showing the Vernaculars with which the passed Candidates are acquainted will be published in this day's and succeeding issues of the "Fort Saint George Gazette."

No. 445.

ORDER THEREON, 19th June 1863, No. 1,601.

Ordered to be recorded.

(Signed) W. I. BIRDWOOD, Colonel, R. E.,
Secretary to Government.

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CIVIL ENGINEERING COLLEGE—MADRAS.

FIRST AND SECOND DEPARTMENTS—*May* 1863.

ARITHMETIC.

TIME 3 HOURS—150 MARKS.

LIEUT. LINDSAY, R. E.—EXAMINER.

1. Find the value of

$$\frac{18}{17} \left(1 - \frac{64}{81}\right) + \frac{8}{11} \times \frac{1}{6} \times \left(\frac{1}{2} + \frac{5}{12}\right)$$

2. Find the value of

$$3 \text{ Weeks } + \text{ days } + 1\frac{1}{2}$$

3. Reduce $\frac{4111}{33300}$ to a decimal, and find the value of $(2\cdot8 \text{ of } 2\cdot\dot{2}7) + 1\cdot1\dot{3}\dot{6}$

4. If 14 men can perform a piece of work in $17\frac{1}{2}$ days; in how many days can 35 men do the same work?

5. Find the product of 207 ft. 9 in. $\times$ 7 ft. 10 in. by duodecimals.

6. If a board be 8 inches broad, what must be its length, to contain 12 square feet?

7. Find the square roots of 7225; 3000; 4325; and $27\frac{1}{4}$ to four places of decimals.

8. Find the cube roots of 941192; 7854 and $\frac{8}{27}$; to four places of decimals.

N.B.—Every answer must be worked out in full. The mere statement of the answer will not obtain any marks.

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CIVIL ENGINEERING COLLEGE—MADRAS.

FIRST DEPARTMENT; AND FIRST CLASS, SECOND DEPARTMENT—May 1863.

ON BUILDING MATERIALS AND THE CONSTRUCTION OF BUILDINGS.

TIME 3 HOURS—150 MARKS.

CAPTAIN H. L. PRENDERGAST, R. E.—EXAMINER.

1. What qualities are to be aimed at, in making bricks for building purposes?
2. What is the best material for making bricks, and what is the result of an excess of either of the component parts?
3. Define 'mortar,' 'quick lime,' 'slaked lime,' and explain the difference between common lime and Hydraulic lime.
4. Describe the process of plastering with one coat as is customary at Madras.
5. What is jagghery used for, and what quantity would you use in proportion to the bricks and chunam employed?
6. Describe English bond. Describe the best arrangement of courses as a general rule; and for a building such as a high chimney; giving your reasons in each case.
7. How would you prepare stone for rubble stone work, and what shape of stones do you prefer?
8. What are footings? what is their object? in what cases are they unnecessary?
9. In building a roof: the beams are 18 feet long, and the joists 11 feet long, what depth and breadth would you give to each?
10. Describe, with a rough drawing, the usual method of constructing a couple roof.
11. Describe the construction of a sloping terrace, or Bengal roof.
12. What is the cause of cracks in a terrace roof? how would you repair them?
13. Show by a rough diagram, the component parts of a king-post truss, and state the use of each.
14. Describe and give a sketch of a good scarf to form a tie beam.
15. Explain the method of fixing the iron stirrups to unite the feet of principal rafters with the tie beam.
16. Up to what span may the king-post truss be used? if a wider span is required, what alteration would you make in the truss?
17. What weight will break a beam, 4 inches broad, 8 inches deep, and of 20 feet clear span: the breaking weight of the wood being 800?

CIVIL ENGINEERING COLLEGE—MADRAS.

FIRST DEPARTMENT ; AND FIRST CLASS, SECOND DEPARTMENT—May 1863.

STATICS.

TIME 3 HOURS—150 MARKS.

CAPTAIN P. O'CONNELL, R. E.—EXAMINER.

1. Find the centre of gravity of an irrigation sluice of the following dimensions, the material being brick in chunam.

	Length.	Breadth.	Depth.
Front wall-Foundations.....	10'	3'	4'
Do. above.....	10	2	6
Rear wall-Foundations.....	9	3	4
Do. above.....	8	2	5
Body-external dimensions.....	16'	4'	4'
Deduct Orifice.....	16	1'	1

The under surfaces of the foundations of the front or rear walls being on the same level, three feet below the under surface of the sluice ; and the centres of the body of the sluice, and of the two walls being in the same vertical plane.

2. Find the centre of Gravity of a sluice having the same dimensions as the last and of the water in it, when the depth of the water is six inches, and the front wall is entirely of granite ; the rest of the sluice being of brick in chunam. The weight of granite may be taken at 160 lbs. to the cubic foot, that of the brick in chunam at 120 lbs., and the water at $62\frac{1}{2}$ lbs. to the cubic foot.

3. A wall of brick in chunam, weighing 120 lbs. to the cubic foot, is 10 feet in length, 8 feet in height, 2 feet wide at top and 4 feet wide at its base ; the rear face being vertical and the front having a batter of one in four. It stands upon an immoveable granite floor, but is not cemented thereto, the brick and the granite being in contact, a single pressure of 15,000 lbs. being applied to the centre of the summit of the wall it is on the point of turning over on to the face which is battered, what is the inclination of this pressure to the horizon ?

4. If the direction of the force is to be horizontal, what must it amount to in order that the wall may be on the point of turning over on to its vertical face.

5. The principals of a king-post truss have a rise of one foot to every three feet horizontal ; each principal is forty feet in length and supports 400 square feet of roofing. What is the strain upon the tie beam when the weight of the roof is 13 lbs to the square foot ?

6. Prove the truth of the principle of the equality of moments.

CIVIL ENGINEERING COLLEGE—MADRAS.

FIRST AND SECOND DEPARTMENTS—May 1863.

MENSURATION.

TIME 3 HOURS—100 MARKS.

CAPTAIN H. N. D. PRENDERGAST, R. E.—EXAMINER.

1. The sides of a triangle are 30 chains, 40 chains and 50 chains. How many acres does it contain?
2. A tank bund contains 1575 cubic yards of earth, it is 15 feet high, 9 feet broad at top with a slope of 2 to 1 on one side and 1 to 1 on the other side. How many yards long is it?
3. What is the difference between the area of a square whose diagonal is $10\sqrt{2}$ that of a circle with a radius of 5?
4. A Barrack for 100 men is 200 feet long, 25 feet wide, and 12 feet high. What superficial area does this allow per man? and how many cubic feet of air per man?
5. Into a cistern 4 feet square 200 gallons of water are poured. How deep is the water? If eight cubical stones, each containing one foot of granite, be afterwards placed at the bottom of the cistern, to what height will the water rise in the cistern?
6. A weight may be supported by a beam $20 \times 12 \times 6$ or by a wall 18 feet long, $1\frac{1}{2}$ feet thick and 8 feet high with foundations 18 feet long, 2 feet wide and $1\frac{1}{2}$ feet deep. Timber costs Rupees 3 per foot cubic; Masonry Rupees 3 per yard cubic. Which support is the cheaper?
7. A circular tent is 10 feet in diameter, its vertical walls are 5 feet high, the roof is conical, its slant height 14 feet. How many yards of canvas would suffice to make 1000 such tents?
8. Compare the weight of a round shot with that of a cylindrical bolt whose length is twice the diameter of the bore,—both projectiles exactly fitting the same siege gun.
9. The areas of the ends of a round log 30 feet long are 400 inches and 484". How many cubic feet does the log contain.

By app/whb

CIVIL ENGINEERING COLLEGE—MADRAS.

FIRST DEPARTMENT, AND FIRST CLASS, SECOND DEPARTMENT—May 1863.

PRACTICAL HYDRAULICS

TIME 3 HOURS—150 MARKS.

MAJOR SANKEY, R. E.—EXAMINER.

- I. At what velocities per Second would the following Substances be moved from the bed of a river.

Common clay,
Common river sand,
Large Shingle,
Broken Stones.

- II. A river has the following section:—measured horizontal breadth from the top of one bank to the opposite one 1000 feet—Bed horizontal and 20 feet lower than this—Slope of either bank to horizon 45° —Fall of bed per mile 2 feet.

Find discharge in cubic yards per hour when the depth of water passing down is 10 feet?

- III. An anicut with crown 5 feet above level of bed is built across the above stream and it is proposed to place upon it a bridge. The piers are to be 30 in number, each 5 feet thick, and the abutments touch either end of the anicut.

If the highest known flood be 15 feet above the unobstructed bed of the river, calculate the rise in feet which would be due to the anicut and piers combined, and what height it will be necessary to make the piers in order to insure the springing of the arches being exactly in a level with the flood line?

- IV. With the above anicut (leaving out of consideration the bridge) it is wished to insert under-slucies in the body of the work, of sufficient capacity to discharge all the water which would otherwise flow over the crown at one foot in depth. The sluice openings will be one yard square in Section, with soles on same level as bed of stream—How many of them would be required to effect the object in view?

- V. It is wished to draw off the water of a reservoir through a pipe placed horizontally in the base of the bund.

Diameter of pipe..... 6 inches.
Length..... 40 feet.
Effective head..... 20 feet.

Calculate discharge in cubic feet per hour? also the diameter which would be required for another pipe also placed horizontally above this, so as to insure its giving the same discharge, when its

Length is..... 30 feet.
Effective head..... 10 feet.

- VI. How would you ascertain the velocity of a river experimentally, and thence deduce the mean velocity for determining the discharge?

24/0001/06/01

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CIVIL ENGINEERING COLLEGE—MADRAS.

FIRST CLASS, SECOND DEPARTMENT—May 1863.

MECHANICAL ENGINEERING.—STEAM.

TIME 3 HOURS—50 MARKS.

R. KENNEDY, ESQ.—EXAMINER.

1. State generally how steam is generated, and applied as a motive power.
2. What is the difference between condensing, and non condensing Engines; and what pressure per square inch working the former, would (theoretically) be equal in mechanical effect to a pressure of 25 lbs. per inch on the latter?
3. State briefly the action of steam in a condensing Engine, from its leaving the boiler until its effect ceases.
4. What is the usual mechanical arrangement, by which, in an ordinary land Engine, rectilinear alternating motion is converted into uniform circular motion?
5. What is the use of a fly wheel? and what other mechanical arrangement is adopted where it is not used, as in Marine Engines? &c.
6. How many revolutions does the crank shaft make, to $3\frac{1}{2}$ double strokes of the piston?
7. What is the principal object secured in the use of tubes in tubular boilers?
8. State generally the conditions necessary, for the efficient and safe working of a Steam Boiler.
9. What is meant by working steam expansively? and how is this generally effected.
10. Required the power of an Engine, working at an effective pressure of 20 lbs. per square inch, with a piston 20 inches in diameter, and making 20 double strokes of 3 feet stroke per minute.
11. What proportion does the evaporative power of ordinary wood, bear to that of ordinary coal?
12. If a hundred weight of coals, raise a given quantity of water from a temperature of 32 degrees to 212 degrees, what weight would be consumed in converting the same quantity of water into Steam?
13. What is the elastic force of steam at a temperature of 212 degrees, and what height of a column of mercury would it support?
14. How many pounds of water does one pound of coal evaporate practically, and how many should the same quantity evaporate theoretically? and what are the mechanical forces generated, practically and theoretically, by the combustion of one lb. of coal?

CIVIL ENGINEERING COLLEGE—MADRAS.

FIRST AND SECOND DEPARTMENTS—May 1863.

SURVEYING AND LEVELLING.

TIME 3 HOURS—125 MARKS.

LIEUTENANT H. W. WOOD, R. E.—EXAMINER.

1. In laying off a line, which passes through a house; how would you overcome the obstruction?
2. Being on the bank of an unfordable river; wishing to know its breadth and having a measuring tape and some pegs: how would you proceed?
3. What do you understand by the Expression "Scale १०००" and if a plan be drawn to this Scale, how many inches on the plan would be equal to one mile?
4. Give a concise description of how a piece of ground is surveyed by the chain only—and show the use of tie lines. Illustrate by a diagram.
5. Having a Prismatic compass and chain, show how you would commence the survey of a piece of country. Give an imaginary sketch.
6. What is a vernier? and construct one to read to 30" (seconds) for a Theodolite whose circle is divided into $\frac{1}{2}$ degrees.
7. What are the uses of the Pocket Sextant—and how would you ascertain the height of a building with one?
8. In taking with the sextant, the angle between two objects (the one much elevated above the other) what artifice is adopted to obviate the necessity of a correction being applied to the observed angle? Also state why a correction would be necessary, if the artifice was not adopted?
9. Explain what the "Datum Line" in Levelling is—also why it is used.
10. Plot the following Levels, on the following scales, viz. Vertical scale 20 feet to one inch—Horizontal scale 200 yards to one inch.

Datum Line 50 Feet Below $\odot$ A.

Datum Line 50 Feet Below $\odot$ A.						
Back sight.	Fore sight.	Rise.	Fall.	Reduced Levels.	Distance.	Remarks.
					Chains.	
					6.00	
					12.00	
					18.00	
					24.00	
3.50	7.57					
5.04	7.39					
4.04	7.00					
6.10	5.93					
6.81	4.86					

11. What is the meaning of "B. M. at A" in the column of remarks of the last question, and explain what you mean by check levels.
12. What are the adjustments of the Y Level and what is meant by the line of collimation.
13. What is refraction, and what is its effect—what is the general correction for it, and how is such correction applied?
14. Show by a diagram how the necessity for correction on account of Curvature of the earth arises—and compute what that correction should be.
15. How is the necessity of applying corrections for curvature and refraction practically obviated in the field,

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CIVIL ENGINEERING COLLEGE—MADRAS

FIRST CLASS SECOND DEPARTMENT.—May 1863.

TRIGONOMETRICAL SURVEYING.

TIME 3 HOURS.—75 MARKS.

LIEUTENANT H. W. WOOD, R. E.—EXAMINER.

1. In the choice of stations, in a Trigonometrical Survey; what are the points which should principally be attended to? Also explain what is meant by a "well conditioned" triangle.
2. Describe the method of laying out a base line, and what are the Instruments generally employed?
3. Explain the operation called "Traversing by Gale's method." Give a diagram showing the mode of proceeding for at least four stations—also state what is meant by a back angle and what is its use?
4. Explain the process of reducing angles to the centre of a station.
5. The distances of three remote objects from each other being known and the angles they subtend at a Station S in the same Horizontal Plane; it is required to find the distance of Station S from each of these three objects.
6. Suppose in making a Survey that the distance between two points P and Q has been determined equal to 6,594 yards and that A and B are conveniently situated for extending the triangles; it is required to determine the distance A B when the angles $P A Q = 85^{\circ} - 46' - 0''$
 $Q A B = 23^{\circ} - 56' - 0''$
 $P B A = 31^{\circ} - 48' - 0''$
 $P B Q = 68^{\circ} - 2' - 0''$
7. Give an explanation with diagram of the method of increasing Triangles without making them "ill conditioned."

24/29/1863

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CIVIL ENGINEERING COLLEGE—MADRAS.

SURVEY DEPARTMENT—May 1863.

SURVEYING WITH THEODOLITE,

TIME 3 HOURS—75 MARKS.

MAJOR. PRIESTLEY.—EXAMINER.

1. Give a brief description of the method of Surveying by traverse.
2. On what Theorem is the traverse system based.
3. What amount of error is allowed in the chain measurement and how are the differences in the Columns of Lat. and Dep. apportioned.
4. What is the third side of the right angled triangle of which the Lat. and Dep. form two; which angle of this triangle is the angle of bearing, and which sides respectively are the sine and cosine of that angle.
5. Describe the method of observing the magnetic bearing of a Station Line with the Theodolite.
6. From the appended notes, form a traverse, table plot the boundary, and compute the content of the village.

194-106-215

CIVIL ENGINEERING COLLEGE MADRAS
SURVEY DEPARTMENT
MAY 1863
MAJOR. PRIESTLEY.—EXAMINER.
TIME 3 HOURS—75 MARKS.
SURVEYING WITH THEODOLITE.
GIVE AN EXPLANATION WITH DIAGRAMS OF THE METHOD OF MEASURING THE MAGNETIC BEARING OF A STATION LINE WITH THE THEODOLITE.
Determine the distance A.B. when the angles A & B are 83° 15' and 70° 15' respectively. The distance A.C. is 6701 yards and the angle C is 100° 15'. Find the distance B.C. and the bearing of B.C. from B.
P.B.C. 100° 15' 100° 15' 100° 15'
P.B.A. 83° 15' 70° 15' 100° 15'
P.B.B. 70° 15' 83° 15' 100° 15'

Perappampolliam.	1026	Δ A.	
	124 730		
	102 482		
	437		
	370	150	
	200	80	
	152	128	
	143° 31' 30"		
	Δ H.		
Perappampolliam.	836		
	139 740		
	144 672		
	650		
	608		
	590	164	
	82° 57'		
	Δ G.		
Perappampolliam.	643		
	16 374		
	92 352		
	190 192		
	174 227° 23'		
	Δ F.		
	917		
	710		
	578		
	344		
	114° 18'		
	Δ E.		
Perappampolliam.	481		
	144		
	124		
	110		
	125° 20' 30"		
	Δ D.		
Perappampolliam.	1404		
	240 698		
	600		
	516		
	92		
	162° 22'		
	Δ C.		
Perappampolliam.	891		
	34 384		
	42 84° 44'		
	Δ B.		
	1318		
	1276		
	730		
	139° 25'		
	Δ A.		

Began at junction of Perappampolliam, Yalacoorchy and Shillagoody.

CIVIL ENGINEERING COLLEGE—MADRAS. FIRST DEPARTMENT, AND FIRST CLASS, SECOND DEPARTMENT—May 1863.

TRIGONOMETRY.

TIME 3 HOURS—150 MARKS.
J. ANDERSON, ESQ.—EXAMINER.

- Find the value of $\sin 45^\circ$, $\cos 60^\circ$, and $\sin 75^\circ$.
- Shew that $\cos (A + B) \cos (A - B) = \cos^2 B - \sin^2 A$.
- Prove the following formulæ:—
(a) $\sin 4A = 4 \sin A \cos^3 A - 4 \cos A \sin^3 A$.
- $\frac{\sin 60^\circ - \sin 30^\circ}{\sin 60^\circ + \sin 30^\circ} = \frac{\tan 60^\circ - \tan 45^\circ}{\tan 60^\circ + \tan 45^\circ}$
- If $2 \cos B = \frac{\sin A}{\sin C}$, the triangle is isosceles.
- The distance of an inaccessible object C being required from a Station A, a base of 275 feet was measured; at A the angle C A B subtended by the object and the other end of the line was $82^\circ 12'$; and at B the angle C B A was observed to be $48^\circ 36'$; find the distances A C and B C.
- Two sides of a triangle are 3 and 12, and the contained angle is 30° ; find the hypotenuse of an equivalent right-angled isosceles triangle.
- Find the radius of a circle described so as to touch the side a of a triangle externally, and the sides b , c , produced.

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CIVIL ENGINEERING COLLEGE—MADRAS.

FIRST CLASS, SECOND DEPARTMENT—May 1863.

DRAWING.

TIME 6 HOURS—125 MARKS.

CAPTAIN TULLOCH, R. E.—EXAMINER.

Design in any style of Architecture a one-storied dwelling house with Terraced Roof, and Verandah all round to contain the following Rooms, viz.:

- 1 Drawing Room,
- 1 Dining Room,
- 2 Bed-Rooms,
- 2 Dressing-Rooms,
- 2 Bath Rooms.

Required Ground Plan, Elevation and Sections.
Scale 8 feet to an Inch.

CIVIL ENGINEERING COLLEGE—MADRAS.

FIRST CLASS SECOND DEPARTMENT—May 1863.

CHEMISTRY OF CLAYS, &c.

TIME 3 HOURS—150 MARKS.

DR. HUNTER—EXAMINER.

- 1.—What is the origin of the clays used in making red bricks?
- 2.—What is the difference in general composition between brown clays—Marls, and Fire clays?
- 3.—What shades of color do brown clays pass through in firing—and in what order do these colors appear in proportion to the heat?
- 4.—What are the properties of Felspar when fresh and when in a decayed state?
- 5.—How can you detect mechanically the properties of clays?
- 6.—What substances are injurious to clays when in excess, and what is the chemical composition of a good strong tough brown clay?
- 7.—What are the contaminations found in Tank and Well waters, and what are the chemical tests for each?
- 8.—What are the best modes of tempering clays; and in what proportions should tough clay, loam and sand be mixed for making bricks, tiles, pipes and roofing tiles?
- 9.—What is the difference between a black clay colored by vegetable matter, and one colored by iron, and how can they be tested?
- 10.—What are the causes of cracks in making building materials and in firing them?
- 11.—What are the properties, color and Chemical qualities of good Fire clays?
- 12.—What is Kaolin and for what is it used?

LIMES AND CEMENTS.

- 13.—What are the principal varieties of Indian Lime?
- 14.—What kinds of lime are the most durable for out door work?
- 15.—Why is shell lime more readily dissolved and acted upon by the weather than other limes?
- 16.—What makes shell lime more durable?
- 17.—What are the characters of good Hydraulic limes and what do they contain?
- 18.—How much sand should be mixed with a rich lime, with a Marly lime, and with Hydraulic lime to make them work and set well?
- 19.—How should limes be burnt and for how long?
- 20.—What are the chemical tests for the different kinds of lime?

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SURVEYING.

H. F. GILBY, Esq.—EXAMINER.

1. Describe clearly the permanent adjustments of Everest's Theodolite, and state why each adjustment is necessary.
2. After having surveyed a polygon by Gale's method, how is the angle at any one station *reversed* so as to continue the survey of the adjoining figure. Explain by a diagram.
3. Construct a Vernier scale to read to single minutes, when a degree on the primary scale is divided into three parts, each division being equal to 20 minutes.
4. What is the proof of the correctness of the angles, and measured distances in a "Traverse Survey?"
5. Fill in the following table, and plot by Gale's method, using Boileau's Traverse Tables for that purpose, also compute the area of the polygon.

[illegible]

89/2881-664

CIVIL ENGINEERING COLLEGE—MADRAS.

FIRST DEPARTMENT—May 1863.

EUCLID.

TIME 3 HOURS—100 MARKS.

F. S. EVANS, Esq., B. A.—EXAMINER.

1. If a straight line fall upon two parallel straight lines, it makes the alternate angles equal to one another; and the exterior angle equal to the interior and opposite upon the same side; and likewise the two interior angles upon the same side together equal to two right angles.
2. All the interior angles of any rectilineal figure, together with four right angles, are equal to twice as many right angles as the figure has sides.
3. In the base of a triangle, find the point, from which lines drawn parallel to the sides of the triangle and limited by them, are equal.
4. Describe a square equal to a given rectilineal figure.
5. If a straight line touches a circle, and from the point of contact a straight line be drawn cutting the circle; the angles which this line makes with the line touching the circle, shall be equal to the angles which are in the alternate segments of the circle.
6. Describe a circle touching a given circle, and touching in a given point a given straight line.
7. About a given circle describe a triangle equiangular to a given triangle.
8. When are four magnitudes said to be proportional? Shew that the Algebraical definition of proportion is included in the Geometrical definition. Also, define ratio, and triplicate ratio.
9. Similar triangles are to one another in the duplicate ratio of their homologous sides.
10. If a straight line PQR cut the sides AB, AC, BC, of a triangle ABC, in the points P, Q, R; prove that the ratio of AP to BP, is equal to the ratio which is compounded of the ratios of CR to BR, and AQ to CQ.
11. The rectangle contained by the diagonals of a quadrilateral figure inscribed in a circle, is equal to both the rectangles contained by its opposite sides.
12. Draw a straight line perpendicular to a plane from a given point above it.
13. Prove that there cannot be more than five regular solids.

22/08/06

EUCLID.

TIME 3 HOURS—100 MARKS.
A. BERRY, ESQ.,—EXAMINER.

1. Define accurately—parallel lines—a semicircle—a gnomon, chord, secant and an arc.
2. Draw a straight line at right angles to a given straight line, from a given point in the same.
The straight lines drawn at right angles to the sides of a triangle, from the points of bisection of the sides, meet at the same point.
3. If a square described upon one of the sides of a triangle be equal to the sum of the squares described on the other two sides of it, the angle contained by these two sides is a right angle.
Having given the difference of the two acute angles, and the hypotenuse, construct a right angled triangle.
4. If a straight line be divided into two equal parts and also into two unequal parts; the rectangle contained by the unequal parts, together with the square of the line between the points of section, is equal to the square of half the line.
The square on any straight line drawn from the vertex of an isosceles triangle to the base is less than the square on a side of the triangle by the rectangle contained by the segments of the base.
5. Draw a straight line from a given point, either without or in the circumference, which shall touch a given circle.
Having given a point P and an angle A C B, draw from the point P a straight line P D E, so as to form a triangle D C E, the perimeter of which is equal to a given straight line.
6. Describe an isosceles triangle, having each of the angles at the base double of the third angle.
7. Describe a circle about a given equilateral and equiangular pentagon.
8. Describe an equilateral triangle, the vertices of which rest on the circumferences of three concentric circles. When is this impossible?

33x-

35x-

- Put down in figures and also in words the following numbers.
39 Thirty nine, 74 Seventy four, 84 Eight and three fourths, 1863 Eighteen hundred and sixty three, 969 Nine hundred and sixty nine.

Give Tamil equivalents for the following words and phrases.
Towards, Square, Dark, Light, Near, Distance, East, West, North, South, Sea, Land, Sun, Moon, Stars, Never mind, Let that go, How strange! What are you about, Go about your business.

Translate.

- (a.) I would rather go than stay.
- (b.) The rains that fell in April were very refreshing.
- (c.) The land wind generally blows in the months of May and June.
- (d.) This is the season for Mangos.
- (e.) There is a man just putting off from shore on a Catamaran.
- (f.) Is he going to catch fish, or to one of the ships in the road?

Give the English of the following.

- (a.) Toḍangum iḍattai kātu.
- (b.) Nām vāsikkāmal viṭṭathu, ērakkuraiya narpathu pakkam allava?
- (c.) Nī koṇḍu vanta nīr kothittathā?
- (d.) Arṇankaraiyil irā tangalāmām.
- (e.) Nallathu, pōróm. Tāmathittāl mosam undāgum.
- (f.) Ithu kāṭṭu valī. Poluthu paṭṭathu.
- (g.) Tonnūṛāyiram peyar irantupónārka!

CIVIL ENGINEERING COLLEGE, MADRAS.

MAY 1863.

Time 2-Hours.

I. Translate into Telugu :—

The Deputy Collector, who was then in the Nanganéri Taluq of the Tinnevely District, wrote a letter to the District Engineer in the month of December, giving information respecting the state of the roads and bridges of that region. It would appear that the rains had been unusually heavy. The country, generally, was flooded and in many places the crops were much injured, and in a few, quite destroyed. The roads suffered greatly from the floods. Several small bridges were swept away. The loss to the state and to private individuals will be great.

II. Translate into English :—

ఒక పేరివాడు పదమూడవ నెల నుండి వడిగొడ్డమీర జెల్లపుకంట్రములను యెక్కించిన వచ్చుకపుడు, దారిలో నొకయెద్దు యెగిరి కంట్రమును క్రింద పడ్రక్కినెను. అప్పుడు అవతాకుడు అచ్చట పశువులు మేపుచున్న యొక పిన్నవానిని పిలిచి “తంబూ, ఈ జెల్లపుకంట్రము నాతోదాడపట్టి యెక్కించుకొనుము. వెనుక నీకు నిండజెల్లము యిచ్చెద” అని వేడికొనెను. ఆ పిల్లకాయ “మంచి” అని అలాగే యెత్తించెను; తరువాత ఆ పేరివాడ వానికి ఒకఉంట జెల్లముయిచ్చెను. పిన్నవాడు “ఇది కొంచెము; నిండయిచ్చు” అనెను. వతాకుడు ఇంకయిచ్చెను. “ఇదియు కొంచెము నిండయిచ్చు” అని యెంతయిచ్చినను ఈ వాగుననే జెప్పి వివాదించుచు ఉండెను. అనంతమునందు అచ్చటికి వచ్చినయొక తెలువరి ఒకఉంటయిచ్చెను. ఏను నగా, ఒకచేతిలో నెత్తికొన్న జెల్లమునకంటె ఇంకొకచేతిలో జెల్లము కొంచెముగా నెత్తికొని, రెండుచేతుల జెల్లమును చూపి, “నాబూ ఇదియెంత? చెప్పు” అనెను. పిన్నవాడు “అది కొంచెము, ఇది నిండ ఉన్నది” అనివలికెను. “ఇది నిండఉంటుంటే తే దీనిని తీసికొనిపోయి” అనెను. వాడు సిగ్గుతో దానిని తీసికొని చూటలాడక పోయెను.

Oka bérivāḍu paḷamati dēsamunundi padigoḷlamīda bellapukāṭṭamulanu yekkinchiko ni vatstsunapuḷu, dirilō nokayeddu yegiri kaṭṭamunu krindapaḍradrōsenū. Apu ḍu āvartakuḍu atstsāṭa paṣuvulu mēputsunna yoka pinnavānini pilichi “tambū, ibellapu kaṭṭamunu nātōkūda paṭṭi yeddamiḍa nekkintsumu. Venuka niku ninḍa bellamu yichcheda” ani vēḍikonenu. Āpillakāya “manchidi” ani āḷāge yettinchenu; taruvāṭa ā bēriseṭṭi vāniki okavunṭa bellamu ichchenu. Pinnavāḍu “idi konchemu; ninḍa yimmu” anenu. Vartakuḍu inka yichchenu. “Idiya konchemu. Ninḍa immu” ani yenta ichchinanu ilāgunanē cheppi vivādintsutsu unḍenu. Ā samayamunandu atstsāṭiki vachchiṇṇa yoka toruyari oka upāyamu chēsenu. Ēmanagā, okachētilō net tikonna bellamunakāṇṭe inkokachētilō bellamu konchemugā nettikoni, reṇḍuchētu la bellamunutsūpi, “bābū idiyenta? chepumu” anenu pinnavāḍu “adi konchemu, idi ninḍaunṇadi” ani palikenu. “Idi ninḍa unḍuachēta dinini tīsikoni pommu” anenu. Bāluḍu siggutō dānini tīsikoni māṭalāḍaka pōyenu.

III. Put down in figures and also in words the following numbers.

33 Thirty nine, 74 Seventy four, $8\frac{1}{4}$ Eight and three fourths, 1863 Eighteen hundred and sixty three, 969 Nine hundred and sixty nine.

IV. Give Telugu equivalents for the following words and phrases.

Towards, Square, Dark, Light, Near, Distance, East, West, North, South, Sea, Land, Sun, Moon, Stars, Never mind, Let that go, How strange! What are you about, Go about your business.

V. Translate.

(a.) I would rather go than stay.

(b.) The rains that fell in April were very refreshing.

(c.) The land wind generally blows in the months of May and June.

(d.) This is the season for Mangos.

(e.) There is a man just putting off from shore on a Catamaran.

(f.) Is he going to catch fish, or to one of the ships in the roads?

VI. Give the English of the following.

(a.) Árambhintsu chótunu tsópumu.

(b.) Nēnu tsaduvaka vidichipeṭṭinadi intsumintsugá nalavadi purāṭalu kadā.

(c.) Nīvu techchina jalamu kāginadā.

(d.) Éṭigaṭṭuna rátri niluvavatstsunaṭa.

(e.) Manchidi. pódumu. Álasyamu chésinayedāla apāyamu kalugunu.

(f.) Idi yaḍavi dāri. Proddu grunkinadi.

(g.) Tombadi vévuru chanipóyiri.

CIVIL ENGINEERING COLLEGE—MADRAS.

FIRST AND SECOND DEPARTMENT—May 1863.

ALGEBRA.

TIME 3 HOURS—150 MARKS.

REV. J. BAMFORTH.—EXAMINER.

1. Find the value of

$$\frac{a}{b} - \left(\frac{1+a}{1-b} \right)^{\frac{1}{2}}, \text{ when } a = \frac{1}{4}, b = \frac{1}{5}.$$

2. Find the value of

$$\frac{3}{4(1-x^2)} + \frac{3}{8(1-x)} + \frac{1}{8(1+x)} - \frac{1-x}{4(1+x^2)}$$

3. Solve the following Equation :—

$$\frac{\frac{3}{x} - 1}{2} - \frac{9\left(\frac{1}{2x} - 1\right)}{\frac{3}{x} - 1} - \frac{2\left(\frac{9}{2x} - 1\right)}{5} = \frac{\frac{9}{x} + 13}{6}.$$

4. Find the value of x, y, z , in the following equation :—

$$\begin{cases} 5x - 11y^{\frac{1}{2}} + 13z^{\frac{1}{3}} = 22 \\ 4x + 6y^{\frac{1}{2}} + 5z^{\frac{1}{3}} = 31 \\ x - y^{\frac{1}{2}} + z^{\frac{1}{3}} = 2 \end{cases}$$

5. A messenger starts on an errand at the rate of 4 miles an hour; another is sent $1\frac{1}{2}$ hours after to overtake him: the latter walks at the rate of $4\frac{1}{4}$ miles an hour; when and where will he overtake him?

6. A farmer sells to one person 9 horses and 7 cows for £300; and to another, at the same prices, 6 horses and 13 cows for the same sum: what was the price of each?

7. Extract the square root of

$$37 - 20\sqrt{3}$$

8. Solve the following equation :—

$$\frac{a+x}{\sqrt{a} + \sqrt{a+x}} + \frac{a-x}{\sqrt{a} + \sqrt{a-x}} = \sqrt{a}$$

9. A debt can be discharged in a year by paying 1s. the first week—3s. the second—5s. the third—and so on; required the amount of the debt, and the last payment.

10. Find the sum of

$$3 + 4\frac{1}{2} + 6\frac{1}{4} + \&c. \text{ to } 5 \text{ terms.}$$

11. How many different sums can be formed with the following coins :—a farthing, a penny, a sixpence, a shilling, a half crown, a crown, a sovereign, and a guinea?

12. Expand $(x^3 + z^3)^{-\frac{1}{2}}$.

84/2851/b.c.

CIVIL ENGINEERING COLLEGE—MADRAS.

FIRST DEPARTMENT ; AND FIRST CLASS—SECOND DEPARTMENT—May 1863.

CONSTRUCTION OF ROADS, BRIDGES, &c.

TIME 3 HOURS—250 MARKS.

CAPTAIN F. MOBERLY, R. E.—EXAMINER.

1. The ground over which it is proposed to carry a canal has a fall of 4 feet per mile—shew how this may be reduced to a more easy gradient.
2. How do you calculate the dimensions for the calingula of a tank ?
3. On what principles would you select the site for a bridge over a large river ?
4. What is a road dam ?
5. Explain the general principle of ghaut tracing.
6. What are the principal points to be kept in view in constructing a road ?
7. Explain the method of carrying a road over a swamp.
8. Explain the nature of a foundation on wells, and the object of retaining walls and aprons under arches of a bridge.
9. Explain the terms transverse and longitudinal slope, as used regarding a road ; and state the limits of each.
10. What is the object of a catch drain ? and where should one be used.
11. Explain the object of a lock in a navigable canal ; state the different parts and their uses.

Detailed Statement of Result of Examination, First Department, Civil Engineering College, May 1863.

NAMES.	Period of Residence in College.	MATHEMATICS.					MECHANICS.	CIVIL ENGINEERING.					SURVEYING AND LEVELLING.					REMARKS.				
		Arithmetic.	Algebra.	Geometry.	Trigonometry.	Mensuration.		Total.	Statics Total.	Preparation of Materials, construction of Buildings and strength of Materials.	Construction of Roads, Bridges and Works of Irrigation.	Practical Hydraulics and Canals.	Total.	Prismatic Compass, Surveying and Levelling in Session.	Do. at Examination.	Trigonometrical and Traverse Surveying at Examination.	Total.		Drawing Total.	Geology.	Chemistry of Clays.	Grand Total.
	Maxm.	150	150	100	150	100	650	150	150	250	150	550	150	125	75	350	200	150	150	2,200		
	Months																					
Lieut. C. C. Saxton.....	8	127	100	29	86	40	301	0	93	150	83	326	110	69	44	223	150	85	131	1,306	Prize in Chemistry.	
A. Rama Row.....	9	148	101	47	108	49	453	8	107	123	47	277	100	79	0	179	120	56	105	1,198		
C. Colundvelu Modeliar.....	9	143	105	68	120	52	488	16	95	113	39	247	100	59	0	159	135	34	65	1,144		
S. Subroya Auchari.....	9	118	132	57	120	58	485	11	94	92	68	254	85	85	0	170	110	43	0	1,073		
G. Ratnam Modeliar.....	9	129	117	49	60	76	431	16	76	75	36	187	90	52	0	142	100	32	0	908		
Lieut. R. A. Skues.....	9	124	69	15	81	51	340	0	72	154	19	245	83	56	0	139	88	64	0	876		
P. Moorogasem Modeliar.....	9	144	83	47	72	85	431	8	74	55	50	179	90	37	0	127	100	28	0	873		
Lieut. A. B. S. Hamilton.....	9	74	29	44	0	94	196	0	85	143	0	228	73	43	0	116	120	68	0	728		
Mr. St. J. H. Buchan.....	9	94	65	19	72	22	272	0	89	88	13	190	50	37	0	87	75	45	0	669		
Lieut. E. G. V. Holloway.....	5½	58	39	20	0	0	117	0	0	0	0	0	70	0	0	70	70	0	0	257		

CIVIL ENGINEERING COLLEGE,
CHEPAUK,
1st June 1863.

W. H. EDGCOMB, CAPTAIN, R. E.

Acting Principal Civil Engineering College.

Detailed Statement of result of Examination, 2nd Department, Civil Engineering College, May 1863.

Department, Civil Engineering College, May 1863.																																
NAMES.	Period of residence in College.		MATHEMATICS.						CIVIL ENGINEERING.						SURVEYING AND LEVELLING.				DRAWING AND ESTIMATING.										REMARKS.			
			Arithmetic.	Algebra.	Geometry.	Mensuration.	Trigonometry.	Total.	Statics Total.	Preparation of Building Materials, construction of Buildings and strength of materials.	Construction of Roads, Bridges, and Works of Irrigation.	Practical Hydraulics and Canals.	Steam.	Total.	Trigonometrical Survey at Examination.	Surveying and Levelling in Session.	Do. at Examination.	Total.	Architectural Drawing in Session.	Topographical in Session.	Drawing at Examination.	Estimating at Examination.	Total Estimating and Drawing at Examination.							Total.	Language.	Geology.
	Maximum Marks.	150																						150	100	100	150	650				
1st Class.			yrs.	mths.																												
1	Gunner W. E. Lippert.....	2	2	139	114	96	88	104	541	58	120	175	95	25	415	18	120	78	206	171	50	102	109	211	432	150	73	119	200	2nd Prize in Mathematics—2nd Prize in Surveying—1st Prize in Drawing—Engineer Officer's Prize as head of class—1st Prize in Language. 1st Prize in Mathematics—2nd Prize in Drawing—2nd Prize in Chemistry. 2nd Prize in Civil Engineering—2nd Prize in Geology. 1st Prize in Civil Engineering—3rd Prize in Mathematics—3rd Prize in Surveying.		
2	Corporal T. M. Rooney.....	1	9	139	120	99	96	107	561	33	124	157	85	30	396	22	100	60	182	120	38	105	97	202	360	81	69	142	182			
3	" J. Nicholson.....	1	9	140	111	68	100	100	519	60	131	159	96	30	416	20	111	57	188	145	40	40	87	177	362	61	95	120	182			
4	Gunner T. Spurr.....	2	0	139	116	84	88	99	526	59	120	179	95	31	425	25	100	71	196	125	35	98	72	170	330	69	78	109	179			
5	Serjeant J. Schoury.....	2	1	136	97	74	88	89	484	54	112	195	75	26	408	18	120	64	202	165	45	119	87	197	407	56	64	115	179			
6	Corporal T. H. Tate.....	2	0	135	92	86	100	72	485	54	125	148	70	26	369	20	108	75	203	120	45	30	72	152	317	88	93	131	174			
7	" A. Smith.....	2	0	140	112	68	88	80	488	58	121	167	85	31	404	20	65	75	160	60	26	80	108	188	274	100	81	128	169			
8	F. Chockalingum Pillay.....	2	4	140	97	78	88	96	499	59	122	107	79	23	331	18	78	65	161	105	40	80	112	192	337	150	52	95	168			
9	Private R. Skehan.....	2	2	140	89	93	99	76	497	7	117	115	94	32	358	20	88	65	173	95	30	85	94	179	304	113	80	110	1642			
10	Corporal J. Mullins.....	1	9	140	100	90	99	84	513	35	98	122	70	21	311	19	96	41	156	120	30	95	86	181	331	130	65	90	1631		2nd Prize in Language.	
11	" J. Allen.....	2	0	139	77	74	88	98	476	6	138	115	53	22	328	30	113	79	222	130	39	68	60	128	297	106	101	58	1594	1st Prize in Surveying—1st Prize in Geology.		
12	" W. C. West.....	1	9	138	92	81	88	84	483	38	119	120	57	31	327	17	113	47	177	150	35	78	95	173	358	44	62	99	1588			
13	" J. B. Sanderson.....	1	9	138	91	96	88	102	515	44	123	115	51	26	315	19	103	57	179	135	45	80	68	148	328	44	44	82	1551			
14	" J. Telford.....	1	9	139	100	90	88	72	489	4	107	102	57	32	298	15	93	49	157	138	35	100	64	184	357	56	84	102	1547			
15	Serjeant J. Parker.....	2	3	140	90	71	83	98	482	20	87	138	74	19	318	14	91	58	163	85	40	63	35	98	223	115	65	128	1514			
16	Private F. Barnes.....	1	9	139	79	81	86	95	480	4	96	128	58	30	312	19	98	60	177	90	35	70	60	130	255	113	54	115	1514			
17	Serjeant J. Ballard.....	1	9	139	73	81	88	86	467	3	105	143	51	28	327	16	106	70	192	120	40	70	63	130	293	50	59	105	1494			
18	Corporal J. F. Slade.....	2	1	140	98	71	86	89	484	54	127	100	54	16	297	15	98	55	168	100	35	65	67	132	267	63	55	104	1494			
19	" W. Dalby.....	2	1	138	97	74	75	89	473	0	93	149	32	15	289	15	75	42	132	110	30	100	43	143	283	113	60	57	1407			
20	" J. C. Littlewood.....	1	9	133	70	72	54	96	425	4	103	45	53	13	214	18	108	41	167	123	38	75	111	186	352	88	66	61	1377			
21	" J. Ellison.....	1	9	137	69	63	49	63	381	4	94	136	53	25	308	13	80	61	154	120	35	80	89	169	324	69	47	80	1367			
22	" A. Nicholson.....	1	9	119	57	20	59	84	339	24	88	109	79	35	311	11	50	40	101	70	25	50	110	160	255	106	83	143	1367	1st Prize in Chemistry.		
23	H. C. Berlie.....	2	2	134	74	75	81	61	425	4	124	108	46	26	304	15	84	61	160	90	30	70	82	152	272	38	56	95	135			
24	Corporal F. Washington.....	2	2	135	96	90	88	69	478	6	89	94	64	87	274	15	75	52	142	60	35	45	89	134	229	56	73	70	132			
25	W. T. P. Moore.....	2	3	132	59	54	82	76	403	6	123	78	53	16	260	15	80	64	159	95	28	63	111	174	297	69	24	74	123	Qualified as Surveyors, 1st Class.		
26	Corporal W. Davis.....	1	9	110	86	47	54	84	381	2	82	103	32	23	240	12	88	35	135	105	30	65	59	124	259	69	39	49	117			
27	G. McIntyre.....	2	2	130	51	63	49	48	341	4	80	73	45	6	204	17	84	48	149	80	26	65	72	137	243	61	23	73	103	" 2nd Class.		
28	A. Wylie.....	2	4	122	46	51	49	30	298	6	81	62	41	10	194	11	60	29	100	70	25	35	38	73	168	94	50	0	90			

CIVIL ENGINEERING COLLEGE,
CHERAX

Qualified for Assistant Overseers.

CIVIL ENGINEERING COLLEGE,
CHEPALK,
1st June 1863.

W. H. EDGCOMB, R. E.
Acting Principal Civil Engineering College.

29/002/1610



7th W 1863 Detach
Proc of Govt for June
from the 7th 1850.
Acting Principal
Civil Engineering College
Dated 9th June 1863
Recd " "

No. 127

19 Examination Papers
1 Detailed Statement

8th 1601-19th June.

Towards Examination
Papers and Detl
Results of the Ex^m
of the College held in
May 1863.

No. 444-445.

 Recd
113

C. 14th June 1863 A. 16th

No 1601

Recorded

Chepanov }
19th June 1863 }

C. 14th June 1863 A-16th