

AN ROINN OIDEACHAIS

(Department of Education.)

LEAVING CERTIFICATE EXAMINATION, 1944.

MATHEMATICS—Algebra—Pass.

WEDNESDAY, 14th JUNE.—MORNING, 10 TO 12.30.

Seven questions may be answered.

Mathematical Tables may be obtained from the Superintendent.

1. Solve for x , y , z the simultaneous equations:—

$$\frac{3}{x} - \frac{1}{y} + \frac{6}{z} = 25$$

$$\frac{1}{x} - \frac{5}{y} - \frac{1}{z} = 4$$

$$\frac{7}{x} - \frac{4}{y} - \frac{7}{z} = -3$$

[28 marks.]

2. Find in the form $\sqrt{x} - \sqrt{y}$ (i) the square root of $49 - 20\sqrt{6}$,
(ii) the fourth root of $49 - 20\sqrt{6}$.

Simplify and evaluate to three places of decimals $(49 - 20\sqrt{6})^{-\frac{1}{4}}$.

[28 marks.]

3. If $x=1$ and $x=-2$ satisfy the equation

$$3x^4 + ax^3 - 2x^2 + bx + 6 = 0,$$

find the value of a , the value of b and the complete solution of the equation.

[28 marks.]

4. Draw a graph of $15 - 2x - x^2$.

For what values of x is the expression (i) positive, (ii) zero, (iii) negative?

For what value of x has it the greatest positive value?

[28 marks.]

5. If the average speed of a train on the run from Cork to Dublin were increased by three miles an hour 30 minutes would be saved on the journey, while if the average speed were reduced by two and one-half miles an hour 30 minutes would be lost on the trip. Find the distance from Cork to Dublin and the average speed of the train.

[28 marks.]

6. If $y = x + x^{-1}$ show that $y^2 - 2 = x^2 + x^{-2}$ and express $x^3 + x^{-3}$ in terms of y .

Find the value of the expression

$$(x^6 + 3x^5 + 5x^3 + 3x + 1)/x^3$$

in terms of y .

[28 marks.]

7. (i) If $\log_{10} 2 = 0.3010300$ find $\log_{10} 25$ correct to five places of decimals.

(ii) How many digits are there in $5^{14} \times 3^7$?

(iii) Find the value of $\log_3 17$ to three significant figures.

[Tables may be used in (ii) and (iii).]

[29 marks.]

8. The sum of the first 12 terms in an arithmetic progression is 72 and the sum of the succeeding 12 terms is 432. Find the first term and the common difference.

How many terms of the series must be taken so that their sum is 176?

[29 marks.]

9. The sum of the first four terms of a geometric progression is equal to $3\frac{1}{2}$ times the sum of the first two terms and the common ratio is positive. Find the common ratio.

If the first term is 8 find the sum of the series to 10 terms.

[29 marks.]

10. Using the same axes and scales draw the graphs of the equations

$$y = x^2(x-3), \quad x - 2y - 2 = 0,$$

from $x = -1$ to $x = +3.5$.

Apply these graphs to find approximate roots of the equation

$$2x^3 - 6x^2 - x + 2 = 0.$$

[29 marks.]