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(Department of Education.)

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(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1941.

PASS.

MATHEMATICS

(ALGEBRA)

TUESDAY, 17th JUNE.—AFTERNOON, 3 TO 5.30 P.M.

Seven questions may be answered.

Mathematical Tables may be obtained from the Superintendent.

1. Solve the equation $ax^2+bx+c=0$, and prove that the sum of the roots is equal to $-\frac{b}{a}$.

(i) If one root of that equation is double the other root what is the relation between a, b, c ?

[28 marks.]

2. Solve the following simultaneous equations:—

$$\left. \begin{aligned} \text{(i)} \quad \frac{4}{3x} + \frac{3}{y} &= -3 \\ \frac{2}{x} - \frac{6}{5y} &= 5 \end{aligned} \right\}$$

$$\left. \begin{aligned} \text{(ii)} \quad 2x - y &= 3 \\ (x+y)^2 &= xy + 1 \end{aligned} \right\}$$

[28 marks.]

3. A bus, plying between A and B which are 30 miles apart, travels at a certain speed. But one day the speed had to be reduced by 6 miles per hour and the bus reached B 25 minutes later than usual. Calculate the usual speed.

[28 marks.]

4. For what value of a is

$$2x^3 + a(x+1)(x-5) - (x^2+7x+8) \text{ divisible by } (x+2)?$$

Assuming that a has that value, solve the equation

$$2x^3 + a(x+1)(x-5) - (x^2+7x+8) = 0.$$

[28 marks.]

5. Factorise the following :—

(i) $x^4 - 7x^2y^2 + 9y^4$;

(ii) $a(a+b)x^2 + (a^2 - 2ab - b^2)xy - b(a-b)y^2$.

[28 marks.]

6. 14 is the fifth term of an A.P. and 8 is the ninth term. Find the first term and the common difference.

How many terms of the series are positive? How many terms must be taken so that their sum is equal to 115?

[28 marks.]

7. The population of a certain city increased from year to year at the rate of 4% per annum for 5 years. For a further period of 8 years it decreased from year to year at the rate of $x\%$ per annum. If the population at the end of the 13th year was the same as it had been at the beginning of the first year, what is the value of x ?

[29 marks.]

8. (i) Find the maximum value of $6 - 4x - 3x^2$;

(ii) For what range of values of x is that expression positive?

Illustrate your answers by a rough graph.

[29 marks.]

9. Find two geometrical progressions each of which satisfies both of the following conditions : the sum of the first and third terms to exceed the second term by 21, and the sum of 5 times the first term and twice the second to be equal to 3.

[29 marks.]

10. Draw a graph of $2x^3 - 3x$ between the values $x = -2$ and $x = +2$, and describe shortly the changes in sign and value of the function in that interval.

Show from the graph that there is a value of x for which the expression becomes equal to 3, and that there are three values of x for which it becomes equal to $\frac{1}{2}$.

[29 marks.]