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LEAVING CERTIFICATE EXAMINATION, 1951.

MATHEMATICS—Algebra—Honours.

TUESDAY, 12*th* *JUNE*.—MORNING, 10 TO 12.30.

Not more than *six* questions may be answered.

Mathematical Tables may be obtained from the Superintendent

1. Solve the following equations :

   (*a*) $x^2-xy+y^2=7,$
   $4x^2-9xy+y^2=-14;$

   (*b*) $x+y-xy=1,$
   $x^2+y^2+x^2y^2=9.$

[40 marks.]

2. Factorize :

   (i) $(a+b+c)^3-a^3-b^3-c^3;$

   (ii) $(a+b)^3(a-b)+(b+c)^3(b-c)+(c+a)^3(c-a).$

[40 marks.]

3. (*a*) Show that

   ${}^{n-1}C_r+{}^{n-1}C_{r-1}={}^nC_r$, where ${}^nC_r$ represents the number of combinations of n things, taken r at a time.

   (*b*) In how many ways can a committee of *six* be chosen from seven women and four men so that at least two men will be on the committee ?

[42 marks.]

Or,

3. Write down the first four terms in the expansion of $\left(1-\frac{2}{5^2}\right)^{\frac{1}{2}}$ and hence find the value of $\sqrt{23}$ correct to four places of decimals. Use a similar method to find $\sqrt[3]{7}$ correct to two places of decimals.

[42 marks.]

4. Find the sum to n terms of

   (*a*) $1+2x+3x^2+4x^3+\ldots\ldots\ldots,$

   (*b*) $2.5+3.7+4.9+\ldots\ldots\ldots,$

[42 marks.]

5. Find the positive root of the equation $x^3+3x^2-2x-5=0$, correct to two places of decimals.

[42 marks].

6. (*a*) Prove from first principles that $\frac{d}{dx}(x\cos x)=\cos x - x\sin x$.

(*b*) Differentiate with respect to x, (i) $\frac{3x-4}{2x+1}$, (ii) $\tan^2(5x+2)$.

[42 marks.]

7. Trace the curve $y^2=x^2(3-x)$, paying special attention to maximum and minimum points and to the infinite branches.

Find the volume generated by rotating the loop about the x-axis.

[42 marks.]

Or,

7. Evaluate :

(i) $\int_0^2 x^3(2x^2-1)dx$,

(ii) $\int_0^1 \frac{2(x+1)dx}{\sqrt{x^2+2x+9}}$,

(iii) $\int_0^{\frac{\pi}{4}} \sin^2 2x dx$.

(iv) $\int_0^{\frac{\pi}{4}} \sec^4 x dx$.

[42 marks].