Philadelphia University

Department of Basic Sciences

Midterm Exam **Computational Number Theory** **28–04–2010**

1. In RSA, we selects $n = 4717 = 89 \times 53$ and $e = 7$. Find the decryption key d.
2. Illustrate Fermat factorization using the number $n = 7169$
3. Illustrate the rho method using $n = 8051$.
4. Evaluate the infinite periodic continued fraction $[1, \overline{2, 3}]$. Write the final answer in the form $\dfrac{P + \sqrt{n}}{Q}$ with all integers.
5. Represent the irrational number $\alpha = \dfrac{36 + \sqrt{15}}{7}$ with an infinite periodic continued fraction, using the following formula.

$$\begin{aligned} \alpha_k &= \frac{P_k + \sqrt{n}}{Q_k} \\ a_k &= \lfloor \alpha_k \rfloor \\ P_{k+1} &= a_k \, Q_k - P_k \\ Q_{k+1} &= \frac{n - P_{k+1}^2}{Q_k} \end{aligned}$$

–Amin Witno