Apps for Solving Engineering Problems Using Numerical Techniques

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Suggested Citation:

Abstract

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1. Introduction

2. Mathematics in Science context

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3. Teaching Numerical Analysis in Engineering context

3.2. A tool for evaluating the internal rate of return

$$NVP = \sum_{k=0}^n \frac{Cf_k}{(1+i)^k} \quad (1)$$

$$0 = \sum_{k=0}^n \frac{Cf_k}{(1+IRR)^k} \quad (2)$$

Figure 1. A tool for evaluating the internal rate of return

3.3. A tool for analyzing four-bar linkage mechanisms

Figure 2. A four-bar linkage mechanism

r

$$r_2 \cos(\theta_2) + r_3 \cos(\theta_3) + r_4 \cos(\theta_4) - r_1 = 0 \quad (4.a)$$

$$r_2 \sin(\theta_2) + r_3 \sin(\theta_3) + r_4 \sin(\theta_4) = 0 \quad (4.b)$$

$$\theta \quad \phi \quad \theta = \alpha \quad \pi$$

$$R_1 \cos(\alpha) - R_2 \cos(\phi) + R_3 - \cos(\alpha - \phi) = 0 \quad (5)$$

$$R_1 = \frac{r_1}{r_2}, \quad R_2 = \frac{r_1}{r_4} \quad \text{and} \quad R_3 = \frac{r_1^2 + r_2^2 - r_3^2 + r_4^2}{2r_2r_4} \quad (6)$$

$$\frac{5}{3} \cos(\alpha) - \frac{5}{2} \cos(\phi) + \frac{11}{6} - \cos(\alpha - \phi) = 0 \quad (7)$$

$$\alpha \quad \phi$$

$$\phi$$

$$\alpha$$

$$\phi$$

Figure 3. A tool for solving a four-bar linkage mechanism

3.4. A tool for studying real gases

$$\left(P + \frac{a}{V^2} \right) (V - b) = R T$$

$$V_0 = b + \frac{R T}{P}$$

Gases reales – Ecuación de Van der Waals

Datos del problema

Gas

Dióxido de carbono

Presión

10 atm

Temperatura

800 K

Solución numérica

Cantidad de iteraciones

10

Tolerancia permitida

10^{-3}

Cálculo del volumen

Valor inicial : solución de la ecuación de gases ideales corregida	Solución numérica de la ecuación de gases reales
6.6074	6.55282

Figure 4. A tool for studying real gases

4. Conclusion

References