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Comment on “A novel analytical solution of mixed convection about an inclined flat plate embedded in a porous medium using the DTM-Padé” by M. M. Rashidi, N. Laraqi and S. M. Sadri, Int. J. Thermal Sciences, 49 (2010) 2405–2412

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ABSTRACT

It is shown that one of the basic differential equations, as well as other important equations of the paper quoted in the title are erroneous and thus the reported results are invalid. This “accident” may have happened because the authors have taken their basic equations from the book of Nield and Bejan (2006) which had printing errors.

In a recent paper of Rashidi et al. [1], the problem of the self-similar mixed convection flows about an inclined flat plate embedded in a saturated porous medium has been revisited. There appears that the authors were not aware of the pioneering paper of Cheng [2] in which this problem has thoroughly been analyzed more than three decades years ago. The same holds for a further basic reference in this research field, namely the work of Lai and Kulacki [3] in which the results of Cheng [3] were extended to the case of permeable ($f_w \neq 0$) surfaces with a lateral mass flux (suction and injection) of the fluid, and in which also a comprehensive numerical solution of the problem has been reported. The aim of Rashidi et al. [1] was to (re)solve the pertinent boundary value problem by the so called differential transform method (DTM). The basic equations (1)–(11), as well as the corresponding text of the paper [1] were transcribed nearly verbatim from the Section 8.1.1 of the book of Nield and Bejan [4]. Unfortunately, the authors of [1] have not realized that several equations of the Section 8.1.1 of [4] contain printing errors. Accordingly, the results of [1] based on these erroneous equations and on further errors committed by the authors, are invalid. For convenience, in the Appendix A the correct versions of these equations are derived in some detail. Specifically, the following equations are concerned.

1. The last Eq. (4) of [1] and the last Eq. (8.4) of [4], both of the same form $U_\infty = Bx^n$, must be replaced by (see the second equation (A.4) of the Appendix)

$$U_\infty = Bx^m \tag{1}$$

   Otherwise, the sentence “The exponent m is related to the angle of inclination $\gamma\pi/2$ (to the incident free stream velocity) by the relation $\gamma = 2m/(m+1)$”, which has been pasted verbatim from [4] in [1], makes no sense.

2. The first Eq. (5) of [1], $\eta = y(U_\infty x/\alpha_m)^{1/2}$, and the first Eq. (8.5) of [4], $\eta = (U_\infty x/\alpha_m)^{1/2}$, both are incorrect and should be replaced by (see Eq. (A.24))

$$\eta = \left(\frac{U_\infty x}{\alpha_m}\right)^{1/2}\frac{y}{x} \tag{2}$$

3. Eq. (6) of [1] and Eq. (8.6) of [4] both have the erroneous form $f_w = -2a/(\alpha_m B)^{1/2}$. The correct expression reads (see Eq. (A.25))

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