ABSTRACT

Efficient numerical techniques are developed for the solution of the diffusion equation: $u_t = u_{xx},\ \ 0 < x < X,\ \ 0 < t \leq T$, subject to $u(x,0) = f(x),\ \ 0 < x < X,\ \ u_x(X,t) = g(t),\ \ 0 < t \leq T$ and subject to the specification of mass $\int_0^b u(x,t)dx = M(t),\ \ 0 < t \leq T,\ \ 0 < b < X$ by using second-order as well as third-order approximations and $u_t = u_{xx} + s(x,t),\ \ 0 < x < X,\ \ 0 < t \leq T$, subject to $u(x,0) = f(x),\ \ 0 < x < X, u(X,t) = g(t),\ \ 0 < t \leq T$, and subject to the specification of energy $\int_0^b u(x,t)dx = M(t),\ \ 0 < t \leq T,\ \ 0 < b < X$ by using third-order as well as fourth-order approximations and the results are compared with the the results of the schemes already present in the literature.