$$v\frac{\partial w}{\partial y}+w\frac{\partial w}{\partial z}=-\frac{\partial p}{\partial y}+\frac{1}{R}\left(\frac{\partial^2 w}{\partial y^2}+\frac{\partial^2 w}{\partial z^2}\right)-k$$

$$\left\{\frac{1}{2}v\frac{\partial^3 w}{\partial y\partial z^2}+\frac{1}{2}v\frac{\partial^2 w}{\partial y^2}+\frac{1}{2}w\frac{\partial^2 w}{\partial z^2}+\frac{1}{2}w\frac{\partial^3 w}{\partial y^2\partial z}-\right.$$

$$\frac{1}{2}\frac{\partial v}{\partial y}\frac{\partial^2 w}{\partial y^2}-\frac{1}{2}\frac{\partial w}{\partial y}\frac{\partial^2 v}{\partial z^2}-\frac{3}{2}\frac{\partial w}{\partial z}\frac{\partial^2 w}{\partial z^2}$$

$$\left.-\frac{1}{2}\frac{\partial w}{\partial y}\frac{\partial^2 w}{\partial y\partial z}-\frac{\partial v}{\partial z}\frac{\partial^2 w}{\partial y\partial z}\right\}-\frac{M^2}{R}w \quad (2.7)$$

and the energy equation:

$$v\frac{\partial T}{\partial y}+w\frac{\partial T}{\partial z}=\frac{1}{RP}\left(\frac{\partial^2 T}{\partial y^2}+\frac{\partial^2 T}{\partial z^2}\right) \quad (2.8)$$

subject to boundary conditions:

$u=0;\ v=-v_0\,(1+\varepsilon\cos\pi z),\ w=0,\ T=1$ at $\bar{y}=0$

$u=1;\ \bar{v}=-\alpha,\ w=0,\ p=p_\infty\ \ T=0$ at $\bar{y}\to\infty$

The parameters introduced in these equations are Reynolds number $R=\frac{UL}{\nu}$, *Prandtl number* $P_r=\frac{\mu C_p}{k}$, Hartmann number $M=B_oL(\frac{c}{\rho\nu})\frac{1}{2}$, suction parameter $\alpha=\frac{v_0}{U}$, Grashof number $G=\frac{\nu g\beta(\bar{T}_w-\bar{T}_\infty)}{U^2}$, visco-elastic parameter $k_2=\frac{k_1}{L^2}$ where $k_1=\frac{2k_0}{\rho}$.

3. *Solution of the problem :*

Since the amplitude ε (<< 1) of the suction velocity is small, we assume the flow velocity u(y,z) in the neighbourhood of the plate as

$$u(y,z)=u_o(y)+\varepsilon u_1(y,z)+\varepsilon^2 u_2(y,z)+\text{---} \quad (3.1)$$

The similar expressions hold for other variables v, w, p and T. When ε=0, equations (2.4) to (2.8) reduce to

$$\frac{dv_0}{dy}=0 \quad (3.2)$$

$$v_0\frac{du_0}{dy}=RGT_0+\frac{1}{R}\frac{d^2u}{dy^2}-k_2\left\{\frac{1}{2}v_0\frac{d^1u_0}{dy^3}-\frac{1}{2}\frac{du_0}{dy}\frac{d^2v_0}{dy^2}-\frac{dv_0}{dy}\frac{d^2v_0}{dy^2}\right\} \quad (3.3)$$

$$v_0\frac{du_0}{dy}=-\frac{dp_0}{dy}+\frac{1}{R}\frac{d^2u}{dy^2}-k_2\left\{\frac{1}{2}v_0\frac{d^3u_0}{dy^3}-\frac{3}{2}\frac{dv_0}{dy}\frac{d^2v_0}{dy^2}\right\}-\frac{M^2}{R}v_0 \quad (3.4)$$

$$v_0\frac{dw_0}{dy}=\frac{1}{R}\frac{d^2w_0}{dy^2}-k_2\left\{\frac{1}{2}v_0\frac{d^3w_0}{dy^3}-\frac{1}{2}\frac{dv_0}{dy}\frac{d^2w_0}{dy^2}\right\}-\frac{M^2}{R}w_0 \quad (3.5)$$

$$v_0\frac{dT_0}{dy}=\frac{1}{RP}\frac{d^2T}{dy^2} \quad (3.6)$$

with the corresponding boundary conditions:

$$u_0=0;\ v_0=-a,\ w_0=0,\ \ T=1\ \text{ at } y=0$$
$$u_0=1;\ v_0=-\alpha,\ w_0=0,\ p_0=p_\infty\ \ T_0=0\ \text{ at } y\to\infty \quad (3.7)$$

The solution of (3.2) is

$v_0=-\alpha$

And equation (3.4) reduces to