TABLE 5.4 **Solution $R_0(\lambda, r)$ and the Norm $N(\lambda)$ of the Differential Equation**

$$\frac{d R_0^2(r)}{dr^2} + \frac{1}{r}\frac{d R_0(r)}{dr} + \lambda^2 R_0(r) = 0 \text{ in } a < r < \infty$$

Subject to the Boundary Conditions Shown

Case No.	Boundary Condition at $r = a$	$R_0(\lambda, r)$ and $\frac{1}{N(\lambda)}$
1	$-\frac{dR_0}{dr} + HR = 0$	$R_0(\lambda, r) = J_0(\lambda r)[\lambda Y_1(\lambda a) + H Y_0(\lambda a)] - Y_0(\lambda r)[\lambda J_1(\lambda a) + H J_0(\lambda a)]$ $\frac{1}{N(\lambda)} = \left\{[\lambda J_1(\lambda a) + H J_0(\lambda a)]^2 + [\lambda Y_1(\lambda a) + H Y_0(\lambda a)]^2\right\}^{-1}$
2	$\frac{dR_0}{dr} = 0$	$R_0(\lambda, r) = J_0(\lambda r) Y_1(\lambda a) - Y_0(\lambda r) J_1(\lambda a)$ $\frac{1}{N(\lambda)} = \left\{J_1^2(\lambda a) + Y_1^2(\lambda a)\right\}^{-1}$
3	$R_0 = 0$	$R_0(\lambda, r) = J_0(\lambda r) Y_0(\lambda a) - Y_0(\lambda r) J_0(\lambda a)$ $\frac{1}{N(\lambda)} = \left\{J_0^2(\lambda a) + Y_0^2(\lambda a)\right\}^{-1}$