

**FIGURE P9-4**

Problems 9-33 to 9-34 From P. H. Hill and W. P. Rule. (1960). *Mechanisms: Analysis and Design*, with permission

†9-33 Figure P9-4a shows a reverted clock train. Design it using  $25^\circ$  nominal pressure angle gears of  $24 p_d$  having between 12 and 150 teeth. Determine the tooth numbers and nominal center distance. If the center distance has a manufacturing tolerance of  $\pm 0.006$  in, what will the pressure angle and backlash at the minute hand be at each extreme of the tolerance?

†9-34 Figure P9-4b shows a three-speed shiftable transmission. Shaft  $F$ , with the cluster of gears  $E$ ,  $G$ , and  $H$ , is capable of sliding left and right to engage and disengage the three gearsets in turn. Design the three reverted stages to give output speeds at shaft  $F$  of 150, 350, and 550 rpm for an input speed of 450 rpm to shaft  $D$ .

† These problems are suited to solution using *Mathcad*, *Matlab*, or *TKSolver* equation solver programs.