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From given strains

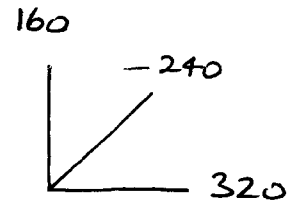
$$\epsilon_x = \epsilon_A = 320 \times 10^{-6}$$

$$\epsilon_y = \epsilon_C = 160 \times 10^{-6}$$

and

$$-240 = \frac{1}{2}(320 + 160) + \frac{1}{2}(320 - 160) \cos 90^\circ + \frac{1}{2}\gamma_{xy} \sin 90^\circ$$

$$\therefore \gamma_{xy} = \underline{-960 \times 10^{-6}}$$

Principal planes given by  $\theta$  where:

$$\tan 2\theta = \frac{\gamma_{xy}}{\epsilon_x - \epsilon_y} = \frac{-960}{320 - 160}$$

$$2\theta = -80^\circ \text{ and } 100^\circ$$

$$\therefore \theta = -40^\circ \text{ and } 50^\circ$$

giving principal strains:

$$\begin{aligned} \epsilon_{-40} &= \frac{1}{2}(320 + 160) + \frac{1}{2}(320 - 160) \cos(-80) \\ &\quad + \frac{1}{2}(-960) \sin(-80) = \underline{567 \mu\epsilon} \end{aligned}$$

$$\begin{aligned} \epsilon_{50} &= \frac{1}{2}(320 + 160) + \frac{1}{2}(320 - 160) \cos 100^\circ \\ &\quad + \frac{1}{2}(-960) \sin 100^\circ = \underline{-407 \mu\epsilon} \end{aligned}$$