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Question:

A shaft runs at 80 rpm & drives another shaft at 150 rpm through belt drive. The diameter of the driving pulley is 600 mm. Determine the diameter of the driven pulley in the following cases: (i) Taking belt thickness as 5 mm. (ii) Assuming for belt thickness 5 mm and total slip of 4%.

Answer:

Ans.: Given data; $N_1 = 80$ rpm. $N_2 = 150$ rpm. $D_1 = 600$ mm. $S = 4\%$ To find; $D_2 = ?$;

(i) Case I: Taking $t = 5$ mm. Velocity ratio, (V.R.) $N_2/N_1 = (D_1 + t) / (D_2 + t)$

$$150/80 = (600 + 5) / (D_2 + 5)$$

Therefore, diameter of driven pulley $D_2 = 317.66$ mm ~ 318 mm

(ii) Case II: Assuming for belt thickness 5 mm and total slip of 4%. Velocity ratio, (V.R.) $N_2/N_1 = \{(D_1 + t) / (D_2 + t)\} \times \{1 - (S/100)\}$

$$150/80 = \{(600 + 5) / (D2 + 5)\} \times \{1 - (4/100)\}$$

Therefore, diameter of driven pulley $D2 = 304.76 \text{ mm} \sim 305 \text{ mm}$
