

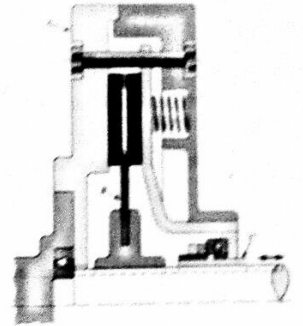


Quiz - 4

Name:
Student #:

key

An axial contact disk clutch has an inner diameter of 160 mm and an outer diameter of 300 mm. Knowing that the allowable pressure for the clutch material is 240 kPa and its coefficient of friction is 0.4, find:



- a) The required actuating force assuming the clutch is old.

$$F = \frac{\pi P_a d}{2} (D - d) = \frac{\pi (0.24) (160)}{2} (300 - 160)$$

$$\Rightarrow \underline{F} = 8445 \text{ N}$$

2 Points

$$F = 8445 \text{ N}$$

- b) The maximum and minimum pressures on the clutch.

$$\underline{P_{max}} = P_a = 240 \text{ kPa} \text{ at } r = r_i$$

$$P_r = \text{const. } P_{max} r_i = P_{min} r_o \Rightarrow P_{min} = \frac{r_i}{r_o} P_{max} = 128 \text{ kPa}$$

$$P_{max} = 240 \text{ kPa}$$

$$P_{min} = 128 \text{ kPa}$$

2 Points

- c) The torque capacity of the clutch.

$$T = \frac{F f}{4} (D + d) = \frac{8445 \times 0.4}{4} (0.3 + 0.16)$$

$$\Rightarrow \underline{T} = 388.5 \text{ N.m}$$

2 Points

$$\text{Capacity} = 2T = 777 \text{ N.m}$$

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- d) If the clutch was replaced with a new one, for the same actuating force what will be the maximum pressure on the clutch and its torque capacity?

$$F = \frac{\pi P_a}{4} (D^2 - d^2) \Rightarrow P_a = \frac{4F}{\pi(D^2 - d^2)}$$

$$\Rightarrow \underline{P_a} = \frac{4(8445)}{\pi(0.3^2 - 0.16^2)} = 166.96 \text{ kPa}$$

2 Points

$$T = \frac{F f}{3} \frac{D^3 - d^3}{D^2 - d^2} = \frac{(8445)(0.4)}{3} \frac{0.3^3 - 0.16^3}{0.3^2 - 0.16^2}$$

$$P_a = 166.96 \text{ kPa}$$

2 Points

$$\Rightarrow \underline{T} = 400.5 \text{ N.m}$$

$$\text{Capacity} = 801 \text{ N.m}$$

$$\text{Capacity} = 2T = 801 \text{ N.m}$$