
A multiplate disc clutch transmits 55 kW.....

Question:

A multiplate disc clutch transmits 55 kW of power at 1800 rpm. Coefficient of friction for the friction surfaces is 0.1. Axial intensity of pressure is not to exceed 160 kN/m2 . The internal radius is 80 mm and is 0.7 times the external radius. Find the number of plates needed to transmit the required torque.

Answer:

Data:- Power=P = 55 KW = $55X10^3$ W ; N= 1800 rpm ; p = 160 KN/m^2 = 160 X 10^3 N/m^2
Internal radius R2 = 80 mm; External radius R1= 80/0.7 =114.28 mm
Coefficient of friction $\mu = 0.1$
No. of plates needed to transmit torque = n = ??
Now using formula of power,

$$P = \frac{2\pi NT}{60}$$

$$55X10^3 = \frac{2 X 3.14 X 1800 X T}{60}$$

T= 291.79 N-m **.....[1 Mark]**

Considering uniform wear theory, for clutches, maximum pressure intensity is at minimum radius, i.e. $R_{min} = R_2$

$p_{max} = C / R_2$

$160 X 10^3 = C/ 0.08$

C= 12800 **.....[1 Mark]**

Axial load $W = 2\pi C(R1 - R2)$

$= 2 X 3.142 X 12800 X(0.1142-0.08)$

W =2756.96 N **.....[1 Mark]**

Considering uniform wear theory, Torque transmitted by clutch

$$T = \frac{1}{2}\mu W(R1 + R2) X n$$

$291.79 = \frac{1}{2} X 0.1 X 2756.96 X (0.1142+0.08) X n$

$n = 10.89 \approx 11$

This is Number of pairs in contact.

No. of plates needed is $n + 1 = 12$.....Ans **.....[1 Mark]**