330:148 (g) Machine Design

Class work – 5 Belt design **October 22, 2007**

1. A fan is driven by a belt from a motor which runs at 880 rpm. A medium double ply leather belt 5/16 inch thick and 10 in wide is used. The diameters of the motor pulley and driven pulley are respectively 14 in and 54 in. The center distance is 54 in and both pulleys are made of cast iron. Coefficient of friction of leather on cast iron is 0.35. The belt weighs 0.035 lb/in^2. What is the horse power capacity of the belt? The allowable stress in the belt may be taken as 350 lb/in^2. (54 hp)
2. A crossed belt drive is to transmit 10 hp at 1000 rpm of the smaller pulley. The smaller pulley has a diameter of 10 in, the velocity ratio of 2 and the center distance is 50 in. It is desired to use a flat belt ¼ in thick with an expected coefficient of friction 0.3. If the max. allowable stress in the belt is 250 psi, determine the necessary leather belt width. The leather weighs 0.035 lb/in^3. (3.32 in)
3. A leather belt 125 mm wide and 6 mm thick transmits power from a pulley of diameter 750 mm at 500 rpm. Angle of contact fro smaller pulley is 150º, coefficient of friction = 0.3, mass of the belt = 1000 kg/m^3 and the maximum permissible stress = 2.75 MPa. Find the maximum power that can be transmitted by the belt. (18.94 kW)
4. Determine the width of a 9.5 mm thick belt required to transmit 11.25 kW from a motor rotating at 750 rpm. The diameter of the driving pulley is 300 mm and that of the driven pulley is 900 mm. The center distance is 3 m and density of leather is 1000 kg/m^3. maximum permissible stress in the belt is 2.46 MPa and coefficient of friction = 0.3. (73.87 mm)
5. A V belt drive is to transmit 25 hp from a 10 in pitch diameter sheave operating at 1800 rpm to a 36 in pitch diameter sheave. The center distance between the input and output shafts is 40 in. and the coefficient of friction for the belt and sheave is 0.2. The cross section of the belt is 1.5 in wide at the top, 0.75 in wide at bottom and 1.0 in deep. Each belt weighs 0.04 lb/in^3 and the allowable tension per belt is 200 lb. How many belts are required? (3)
6. The following data are given for a V-belt drive connecting a 20 kW motor to a compressor.

	Motor pulley	Compressor pulley
Pitch diameter (mm)	300	900
Speed (rpm)	1440	480
Coefficient of friction	0.2	0.2

Centre distance between the pulleys is 1 m. The cross section of the belt is 22 mm wide at the top, 11.81 mm in wide at bottom and 14 mm deep with an included angle of 40º. The density of the belt material is 970 kg/m^3 and the allowable tension per belt is 850 N. how many belts are required for this application? (2)