1. A flange coupling is used to connect two commercial shafts of diameter 50 mm. Four bolts of same material as that of shafts are used in the coupling on a bolt circle of 240 mm diameter. The web thickness is 22 mm. Determine the size of the bolts required and the power transmitted at 200 rpm.
2. A rigid coupling is used to connect a 45 kW, 1440 rpm electric motor to a centrifugal pump. The starting torque of the motor is 225% of the rated torque. There are 8 bolts on a pitch circle diameter of 150 mm. The bolts are made of steel 45 C 8 (Syt = 380 MPa) and the factor of safety is 2.5. Determine the diameter of bolt. Assume (𝑆sy = 0.577 ). Assume that the bolts are finger tight in reamed and ground holes.
3. Design a flange type coupling to transmit 25 kW at 150 rpm. The allowable shear stresses for shaft, bolt and key are 42 MPa. Assume maximum torque to be 25% greater than the full load torque. Find the maximum bearing stress between the bolt and the flange.
4. Design a clamp coupling to transmit 25 kW at 100 rpm. The allowable shear stress for shaft and key is 40 MPa and number of bolts connecting the two halves is six. The coefficient of friction between the muff and the shaft surface may be taken as 0.25. The permissible tensile stress for the bolts is 70 MPa.
5. It is required to design a rigid type flange coupling to connect two shafts. The input shaft transmits 37.kW power at 175 rpm to the output shaft through coupling. The design torque is 1.5 times of the rated torque. Select suitable material for various parts of the coupling, design the coupling and specify the dimensions of its components.
6. Design a bush type flexible coupling to connect motor and centrifugal pump shafts. Motor transmits 10 KW at 1440 RPM. Allowable stress in shear for shaft, key and bolts are 40 MPa. Allowable bearing pressure for rubber bush is 0.3 MPa. Check for stresses.
7. Design a bushed pin type flexible coupling to transmit 90 KW at 1440 RPM for connecting two shafts of diameter 60 mm. Assume bearing pressure on the bushes as 0.35N/mm2, allowable shear stress in the material of the pins as 45 N/mm2 and allowable bending stress in the material of the pin is 80 N/mm2.
8. It is required to design a square key for fixing a pulley on the shaft, which is 50 mm in diameter. The pulley transmits 10 kW power at 200 rpm to the shaft. The key is made of steel 45C8 (𝜎𝑦𝑡=𝜎𝑦𝑐=380 𝑁/𝑚𝑚2) and the factor of safety is 3. Determine the dimensions of the key. Assume (𝜎𝑠𝑦=0.577𝜎𝑦𝑡).