

Seat No.: _____

Enrolment No. _____

KADI SARVA VISHWAVIDYALAYA
MID SEMESTER EXAM

Subject Name: IDMD (ME404)

Total Marks: 30

Branch: B.E 4th (Mechanical)

Date: 03/03/2015

Instructions:

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Assume suitable data

Q-1 Determine the smallest hole that can be punched in 5 mm thick M.S. plate having an ultimate shear stress of 300 N/mm^2 . If permissible compressive strength of punch is 360 N/mm^2 , calculate induced shear stress for punch. **5**

Q-2 A Design a knuckle joint used to connect two rods subjected to a maximum load of 35 kN. The rod is having circular cross-section. The permissible stresses, for rod and pin materials are 90 MPa, 60 MPa and 120 MPa in tension. Shear and crushing respectively. **7**

B Why taper is provided in a cotter? What is the purpose of clearance in Cotter Joints? **3**

OR

A A cast iron pulley attached to shaft transmit maximum torque of 72 kN-mm. The Pulley has four straight arms having elliptical cross section having major axis twice its minor axis. If the permissible stress for pulley material is 8 N/mm^2 , find the cross section of the arm. Neglect radius of hub, where shaft is attached. **5**

B An offset link subjected to load of 25 kN as shown in fig.1. it is made of FG300. Factor of safety has considered 3. Determine dimensions of link. **5**

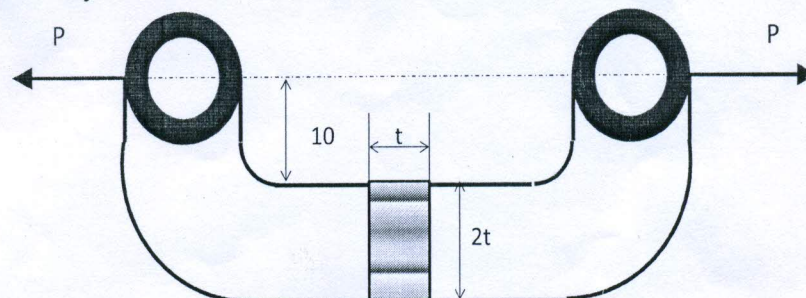


Figure 1

- Q-3** A flexible coupling is required to transmit 30 kW at 300 rpm. There are 6 pins at pitch circle diameter of 210 mm and having their length in contact with left hand flange of 30 mm. The gap between two flanges is 5 mm. The length of bush in contact with the right hand flange is 42 mm. The allowable shear stress and bending stress for pin are 30 MPa and 100 MPa respectively. The allowable bearing pressure for rubber bush is 0.8 MPa. 5

Determine: 1) pin diameter considering shear & bending failure

2) Overall diameter of rubber bush.

- Q-4 A** A shaft supported on two bearings carries two pulleys as shown in figure 2. The shaft transmits 10 kW power at 300 rpm from pulley A to pulley B. The pulley A has a diameter of 300 mm and mass of 15 kg, while pulley B has a diameter of 600 mm and mass of 40 kg. The belt tension act vertically downward and ratio of belt tension on tight side to slack side for each pulley is 3:1. The shaft is made of steel for which the permissible shear stress intensity is 65 N/mm^2 . What should be the diameter of the shaft? Also calculate the shaft diameter based on the torsional rigidity if the permissible angle of twist is 0.4° per meter length. Assume modulus of rigidity for shaft material as $80,000 \text{ N/mm}^2$. 7

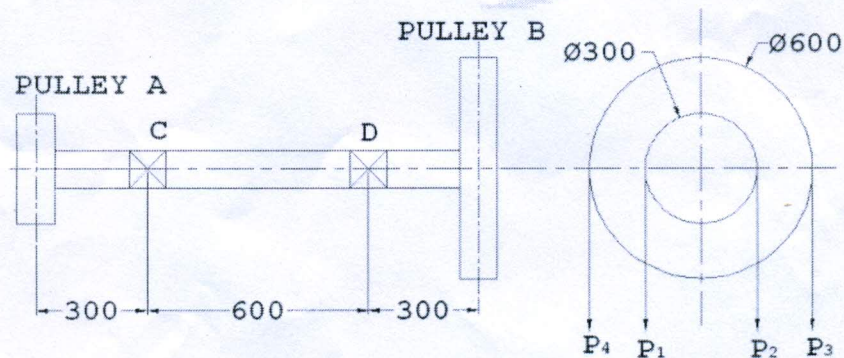


Figure 2

- B** A solid shaft and a hollow shaft having same length are equally strong in torsion. The outside diameter of the hollow shaft is 20% more than the diameter of solid shaft. If both the shafts are made from same material, find the ratio of weight of hollow shaft to the solid shaft. Diameter ratio for the hollow shaft is 0.6. 3

OR

- A** Design a closed coiled helical spring to absorb a blow of 200 N weight which falls through a vertical height of 500 mm. The deflection of spring is 100 mm. The allowable shear stress is 420 N/mm^2 . Take, $C = 6$ and $G = 80 \text{ GPa}$ 7
- B** Explain the importance of Wahl's stress factor in spring design. 3

Best of luck...