

B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATION,
MAY/JUNE 2013

MECHANICAL ENGINEERING BRANCH

Sixth Semester

ME 9353 – DESIGN OF TRANSMISSION SYSTEMS
(Regulations 2008)

(APPROVED DESIGN DATA BOOK PERMITTED)

TIME: 3 hrs

ANSWER ALL QUESTIONS

MAX MARKS: 100

PART – A (10X2 = 20 Marks)

1. What is meant by chordal action in the chain drives?
2. What is creep in belts?
3. Write the advantages of providing backlash in gears?
4. Define – virtual number of teeth.
5. Write the advantages and limitations of spiral bevel gears.
6. Why the efficiency of worm gear drives is low when compared with other types of gear drives?
7. Sketch the layout of double reduction gear box which consists of one spur gear pair and one bevel gear pair.
8. What is the purpose of spacers in gearbox?
9. Write the benefits for considering uniform wear theory in the design of clutch plates, when compared with uniform pressure theory?
10. What is meant by self energizing in brakes?

PART – B (5X16 = 80 Marks)

11. Design the layout of a gear box for a milling machine to provide 12 output speeds ranging from 160 rpm to 2000 rpm. Input speed 1440 rpm. Choose the standard speed ratio and construct the structural ray diagram and kinematic layout. Show the number of teeth for all the gears in the kinematic arrangement.

12 (a). The layout of a leather belt drive transmitting 15 kW of power is shown in Fig12(a). The center distance between the pulleys is twice the diameter of the bigger pulley. The belt should operate at a velocity of 20m/s approximately and the stresses in the belt should not exceed 2.25

N/mm². The density of the leather is 0.95 g/cc and the coefficient of friction is 0.35. The thickness of the belt is 5 mm. calculate the diameter of the pulleys, the length and width of the belt and the belt tensions.

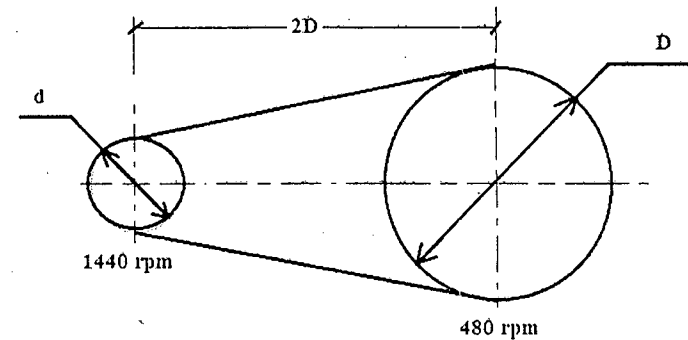


Fig12(a)

Or

(b). Select a suitable wire rope to lift a load of 10 kN of debris from a well 60 m deep. The rope should have a factor of safety 6. The weight of the bucket is 5 kN. The load is lifted with a maximum speed of 150 m/min which is attained in 1 second. Find also the stress induced in the rope due to starting with an initial slack of 250 mm. The average tensile strength of the rope may be taken as $590 d^2$ Newton (where d is the rope diameter in mm) for 6×19 rope. The weight of the rope is 18.5 N/m. Take the diameter of the wire is $d_w = 0.063d$ and the area of the rope $A = 0.38d^2$.

13 (a). In a spur gear drive for a rock crusher, the gears are made of case hardened alloy steel 40Ni 2 Cr 1 Mo28. The pinion is transmitting 18 kW at 1200 rpm with a gear ratio of 3.5. The gear is to work 8 hrs/day for 3 years. Design the drive.

Or

(b). A pair of helical gears subjected to heavy shock loading is to transmit 37.5 kW at 1750 rpm of the pinion. The speed reduction ratio is 4.25 and the helix angle is 15°. The service is continuous and the teeth are 20° full depth in the normal plane. Design the gear drive if the gears are made of case hardened alloy steel 40Ni 2 Cr 1 Mo28.

14 (a). Design a bevel gear drive to transmit 10 kW at 1440 rpm. Gear ratio $i=3$. Material for pinion and gear is C45 steel. Life = 10000 hrs.

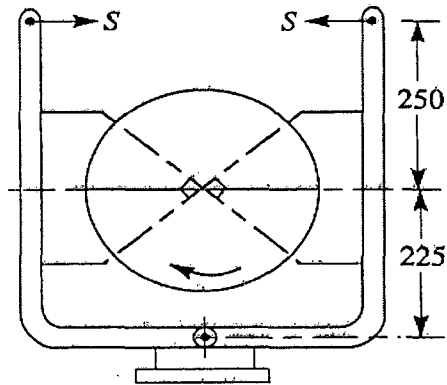
Or

(b). Design a worm gear drive to transmit 22 kW at a worm speed of 1440 rpm. The desired velocity ratio is 24:1 and an efficiency of at least 85% is desired. Material for the worm and worm wheel is carburized steel 15Ni 2 Cr 1 Mo15. Design the drive.

15 (a). A cone clutch with asbestos friction lining transmits 30 kW power at 500 rpm. The coefficient of friction is 0.2 and the permissible intensity of pressure is 0.35 N/mm^2 . The semi cone angle α is 12.5° . The outer diameter is fixed as 300 mm from space limitations. Calculate the inner diameter, the face width of the friction lining.

Or

(b). The layout and dimensions of a double shoe brake is shown in Fig 15(b). The diameter of the brake drum is 300 mm and the contact angle for each shoe is 90° . If the coefficient of friction for the brake lining and the drum is 0.4, find the spring force necessary to transmit a torque of 30 N-m. Also determine the width of the brake shoes, if the bearing pressure on the lining material is not to exceed 0.28 N/mm^2 .



All dimensions in mm.