Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 42854

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Sixth Semester
Mechanical Engineering
ME 2352 – DESIGN OF TRANSMISSION SYSTEMS
(Common to Mechanical and Automation Engineering)
(Regulations 2008)
(Also common to PTME 2352 – Design of Transmission Systems for B.E. (Part-Time) Fifth Semester – Mechanical Engineering – Regulations 2009)

Time : Three Hours | Maximum : 100 Marks

Usage of Approved design data book is permitted.
Answer ALL questions.

PART – A (10×2=20 Marks)

1. Mention the important characteristics of Worm gear.
2. Differentiate crown gears and mitter gears.
3. Classify brakes based on the direction of application of braking force.
4. What is a wet clutch ? State its advantage.
5. Why thin flat belt is preferred than thick narrow belts ?
6. State any two advantages of V belt drive over the flat belt drive.
7. Enlist any two main advantages and disadvantages of helical gears.
8. What are the modes of gear failure ?
9. What is ray diagram ?
10. State the main difference between sliding mesh and constant mesh gear box.

PART – B (5×16=80 Marks)

11. a) Design a gear box to provide 12 output speeds ranging from 25 to 600 rpm. The input speed of 2.25 kW motor is 1440 rpm. Assume standard step ratio and minimum number of teeth in any stage as 20. List the speeds of all shafts.

(OR)

b) Sketch the speed diagram and the kinematic layout for an 18 speed gear box for the following data : Motor speed = 1440 rpm, Maximum and minimum output speed = 800 and 16 rpm respectively. Arrangement = 2×3×3.

12. a) Design a Fort duck flat belt drive to transmit 20kW at 720 rpm to an aluminium rolling machine, the speed ratio being 3. The distance between the pulleys is 3 m. Diameter of rolling machine pulley is 1.2 m.

(OR)

b) A V-belt having a lap of 180° has a cross section area of 2.5 cm^2 and groove angle as 45°. The density of a belt is 0.0015 kg/cm^3 and maximum stress is limited to 400×10^4 N/m^2. If $\mu = 0.15$, find the power that can be transmitted, if the wheel has a mean diameter of 300 mm and runs at 1000 rpm.

13. a) Design a spur gear drive required to transmit 45 kW at a pinion speed of 800 rpm. The velocity ratio is 3.5:1. The teeth are 20° full depth involute with 18 teeth on the pinion. Both the pinion and gear are made of steel with a maximum safe static stress of 180 N/mm^2 and hardness 400 BHN. Assume carefully cut wheels, medium shock conditions (K_0=1.25) with arbitrary initial velocity as 12m/s.

(OR)

b) A compressor running at 360 rpm is driven by a 140 kW, 1440 rpm motor through a pair of 20° full depth carefully cut precision helical gears having helix angle of 25 °. The centre distance is approximately 400 mm. The motor pinion is to be forged steel (40 $Ni_2Cr_1Mo_{28}$) and the driven gear is to be cast steel Grade 1 (CS 65). Assume medium shock conditions, minimum number of teeth in any stage as 20 and hardness 400 BHN. Design the gear pair.

14. a) A pair of straight bevel gears has a velocity ratio of 2:1. The pitch circle diameter of the pinion is 80 mm at the large end of the tooth. A 5 kW power is supplied to the pinion, which rotates at 800 rpm. The face width is 40 mm and the pressure angle is 20°. Calculate the tangential, radial and axial components of the resultant tooth force acting on the pinion and wheel.

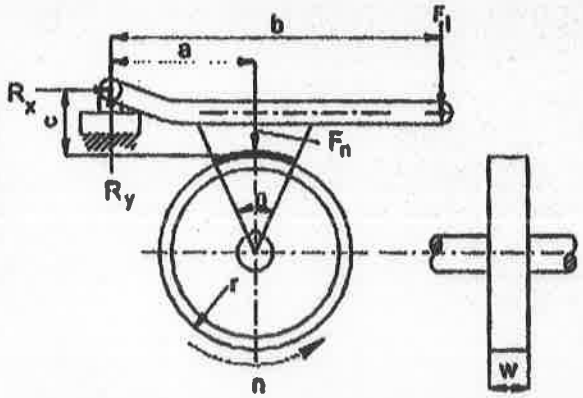
(OR)

b) A double threaded worm drive is required for power transmission between two shafts having their axes at right angles to each other. The worm has $14_{1/2}^{\circ}$ involute teeth. The centre distance is approximately 200 mm. If the axial pitch of the worm is 30 mm and lead angle is 23°, find 1. Lead, 2. Pitch circle diameters of worm and worm gear 3. Helix angle of the worm 4. Efficiency of the drive if the coefficient of friction is 0.05. Determine whether or not the drive is self-locking.

15. a) A multi plate disc clutch transmits 55 kW of power at 1800 rpm. Coefficient of friction for the friction surfaces is 0.1. Axial intensity at pressure is not to exceed 160 kN/m^2. 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.

(OR)

b) A short shoe block brake shown in fig has a coefficient of friction 0.3, has to absorb a frictional power of 14.924 kW at 650 rpm. What is the actuating force required ? Can the brake be self-locking ?



b =1m
r =0.375m
a =0.375m
c =0.05m