

End Semester Examinations - 2015-16 Even Semester - May 2016

14ME2028 Design of Transmission Systems

Set A

Time : 3 hrs
Total Marks: 100

1. The operating schedule of a ball bearing is as follows:
- (a) Radial load of 1650 N at 2000 rpm for 5 % of life time
 - (b) Radial load of 1140 N at 3300 rpm for 15 % of time
 - (c) Radial load of 560 N at 1750 rpm for 35 % of time and
 - (d) Radial load of 445 N at 2200 rpm for 45 % of time.

The loads are steady. The life is to be 10 years at 2 hours per day operation. Select a suitable ball bearing. Assume 300 working days a year. Choose the bearing from 63 series.

OR

2. Select a flat belt to drive a mill at 250 rpm from a 10 kW, 730 rpm motor. The centre distance is 2 m. The mill shaft pulley is 1 m in diameter and the diameter of the smaller pulley is around 345 mm. Design the belt drive.
3. Design a chain drive to run a compressor from a 11 kW motor at 970 rpm. The compressor rpm is 330. The minimum centre distance is 500 mm. Compressor is to work for 16 hours/day.
- OR**
4. A speed reducing unit using spur gear is to be designed. Power to be transmitted is 45 kW. The speeds of the shafts are 720 rpm and 144 rpm respectively. The material for pinion is taken as 15 Ni2 Cr1 Mo15 and that of gear is C45. Design the gears and give its details.
5. Design a worm gear drive to transmit 18 kW at 600 rpm. Speed ratio is 20. The worm is made of hardened steel and the wheel is made of chilled Phosphor bronze. The number of starts on the worm is to be considered as 3.

OR

6. A radial cam rotating at 150 rpm is driving a 15 mm diameter translating roller follower to produce the following motions: rise of 25 mm with SHM in 150° of cam rotation; dwell for 60°; fall of 25 mm with SHM in 120° of cam rotation and dwell for remaining 30°. Construct the cam contour when the pressure angle is approximately 20°.
7. Spindle of a drilling machine runs at 12 different speeds in the range of 100 rpm to 355 rpm. Design a three stage gear box. Sketch the layout of the kinematic arrangement of the gear box and also the ray diagram. The gear box receives 5 kW from an electric motor running at 360 rpm. Use the structural formula as $3 \times 2 \times 2$.
- OR**
8. Determine the geometric dimensions of a six station Geneva wheel for the driving crank radius of 50 mm. Also find the instantaneous angular velocity and angular acceleration of the geneva wheel when the crank angle $\phi = 20^\circ$; speed of crank is 150 rpm.
9. A braking system of a lift mechanism needs a ratchet and pawl arrangement. The torque is 500 Nm; Number of teeth on ratchet is 18. Material may be assumed as steel / steel (hardened). Design the ratchet and pawl arrangement and also check for allowable pressure and bending stress. Assume Allowable bending stress = 30 N/mm^2 and $\psi = 2.5$