**Department of Mechanical Engineering**

**ME6601 – DESIGN OF TRANSMISSION SYSTEMS**

1. Select a flat belt to drive a mill at 250 rpm from a 10 kw, 730 rpm motor. Centre distance is to be around 2m. The mill shaft pulley is of 1 m diameter.

2. Design a V-belt drive to the following specifications: Power to be transmitted 7.5 KW, Speed of driving wheel 1440 rpm, speed of driven wheel 400 rpm, Diameter of driving wheel 300 mm, Center distance is 1000 mm, Service 16 hours/ day.

3. A truck equipped with a 9.5 kw engine uses a roller chain as the final drive to the rear axle. The driving sprocket runs at 900 rpm and the driven sprocket at 400 rpm with a centre distance of approximately 600 mm. Select the roller chain.

4. A workshop crane carries a load of 30 kN using wire ropes and a hook. The hook weighs 15 kN. Diameter of the rope drum is 30 times the diameter of the rope. The load is lifted with an acceleration of 1m/s2. Find the diameter of the rope . FS = 6, Er = 80 kN/mm2, σu= 180 kN/mm2, cross section of the rope = 0.4 X (dia. of rope)2.

5. A 15 KW squirrel cage motor, 1250 rpm is driving a centrifugal pump at 550 rpm. The centrifugal pump is located at 700mm from the motor. Design a chain drive.

6. A compressor is to be actuated from a 10 KW electric motor. The speed of the motor shaft is 1000 rpm and the compressor speed being 350 rpm. The minimum centre distance is 500 mm. The compressor operates 16 hours per day. Design a suitable chain drive.

7. In a spur gear drive for a rock crusher, the gears are made of case hardened alloy steel. 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’s major dimensions, check for compressive and bending stresses and sketch the arrangement.

8. In a spur gear drive for a stone crusher, the gears are made of C40 steel. The pinion is transmitting 30 KW at 1200 rpm. The gear ratio is 3. Gear is to work 8 hours per day, six days a week and for 3 years. Design the drive.

9. A general purpose enclosed gear train is based on parallel helical gears, specified life is 36,000 hours. Torque at driven shaft is 411Nm. Driving shaft speed is 475 rpm. Velocity ratio is 4. It is desired to have standard center distance. Design the gear drive.

10. In a spur gear drive for a stone crusher, the gears are made of C40 steel. The pinion is transmitting 20 kw at 1200 rpm. The gear ratio is 3. Gear is to work 8 hrs per day, six days a week and for 3 years. Design the drive.

11. Design a pair of helical gears to transmit 10 kw at 1000 rpm of the pinion. Reduction ratio of 5 is required.

12. A helical gears with 30˚ helix angle has to transmit 35 KW at 1500 rpm with a speed reduction ratio 2.5. If the pinion has 24 teeth, determine the necessary module, pitch diameter and face width for 20˚ full depth teeth. Assume 15 Ni 2 Cr 1 Mo 15 material for both pinion and wheel.

13. Design a bevel gear drive to transmit 10 KW at 1440 rpm. Gear ratio is 3, material for pinion and gear is C45 steel. Minimum number of teeth is to be 20.

14. Design a bevel gear drive to transmit 3.5 kW. Speed ratio = 4. Driving shaft speed = 200 rpm. The drive is non-reversible. Pinion is of steel and wheel of Cl. Assume a life of 25,000 hours.

15. Design a worm gear drive to transmit 22.5 kW at a worm speed of 1440 rpm. Velocity ratiois 24:1. An efficiency of atleast 85% is desired. The temperature rise should be restricted to 40°C. Determine the required cooling area.

16. Design a bevel gear drive to transmit 7.36 kw at 1440 rpm for the following data. Gear ratio = 3. Material for pinion and gear C45 surface hardened.

17. Design a worm drive for a speed reducer to transmit 15 kw at 1440 rpm of the worm shaft. The desired wheel speed is 6 rpm. Select suitable worm and wheel materials.

18. A hardened steel worm rotates at 1440 rpm and transmits 11 KW to a phosphor bronze gear with gear ratio of 15. Design the worm gear drive and determine the power loss by heat generation.

19. Design a nine speed gear box for a minimum speed of 35 rpm and a maximum speed of 560 rpm. Draw the speed diagram and kinematic arrangement showing number of teeth in all gears.

20. A gear box is to be designed with the following specifications: Power = 14.72 kW. Number of speeds = 18. Minimum speed 16 rpm.Step ratio = 1.25. Motor speed = 1400 rpm. The 18 speeds are obtained as 2×3×3. (i) Sketch the layout of the gear box (ii) Draw the speed diagram.

21. A 14 speed gear box is required to furnish out speeds in the range of 125 rpm to 2500 rpm. Draw the speed diagram and the kinematic arrangement.

22. The minimum and maximum speed of a six speed gear box are to be 160 and 500 rpm. Construct the kinematic arrangement and the ray diagram of the gear box. Also find the number of teeth on all gears.

23. Design a 12 speed gear box for an all geared headstock of a lathe. Maximum and minimum speeds are 600 rpm and 25 rpm respectively. The drive is from an electric motor giving 2.25 kw at 1440 rpm.

24. Design a 12 speed gear box for an all geared headstock of a lathe by drawing speed diagram. Show the details in a kinematic layout . The maximum and minimum speeds are to be 1400 rpm and 112 rpm respectively.

25. A single plate clutch is used for an engine that develops a maximum torque of 120 N-m. Assume a factor of safety of 1.5 to account for slippage at full engine torque. The permissible intensity of pressure is 350 kpa and the coefficient of friction is 0.35. Calculate the inner and outer diameters of the friction lining and the axial force to be exerted by the springs to engage the clutch.

26. Derive an expression for the braking torque considering a single shoe brake: Explain self –locking and self- energising brakes.

27. A multi – disc clutch has three discs on the driving shaft and two on the driven shaft is to be designed for a machine tool, driven by an electric motor of 22 kw running at 1440 rpm. The inside diameter of the contact surface is 130mm. The maximum pressure between the surfaces is limited to 0/N/mm2. Design the clutch. Take μ = 0.3 ; n1 = 3; n2 = 2.

28. A single plate clutch, both sides being effective, is required to connect a machine shaft to a driver shaft which runs at 500 rpm. The moment of inertia of the rotating parts of the machine is l kgm2. The inner and outer radii of the friction discs are 50 mm and 100 mm respectively. Assuming uniform pressure of 0.1 N/mm2 and coefficient of friction of 0.25, determine the time taken for the machine to reach full speed when the clutch is suddenly engaged. Also determine the power transmitted by the clutch, the energy dissipated during clutch slip and the energy supplied to the machine during engagement.

29. Determine the capacity and the main dimensions of a double block brake for the following data: The brake sheave is mounted on the drum shaft. The hoist with its load weights 45 kN and moves downwards with a velocity of 1.15 m/s. The pitch diameter of the hoist drum is 1.25m. The hoist must be stopped with in a distance of 3.25 m. The kinetic energy of the drum may be neglected.

30. An automotive type internal-expanding double shoe brake as shown in fig. The face width of the friction lining is 40mm and the intensity of normal pressure is limited to 1 N/mm2. The coefficient of friction is 0.32. The angle Ө1 is can be assumed to be zero. Calculate (i) the actuating force P, and (ii) the torque-absorbing capacity of the brake.