Reg. No.												

Question Paper Code	11861

12 JUN 2023

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2023

Sixth Semester

Mechanical Engineering

20MEPC601 – DESIGN OF TRANSMISSION SYSTEMS

(Regulations 2020)

(Use of Approved Design Data Book is permitted)

Duration: 3 Hours Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	In what ways, timing belts are superior to ordinary V-belts?	*2,K2,CO1*
2.	What are the various stresses induced in wire ropes?	*2,K1,CO1*
3.	What are the types of gears-failures?	*2,K1,CO2*
4.	Differentiate Herringbone gear and double helical gear.	*2,K2,CO2*
5.	In which gear-drive, self-locking is available?	*2,K1,CO3*
6.	What is a crown gear?	*2,K1,CO3*
7.	What is a speed diagram?	*2,K1,CO4*
8.	List any two methods used for changing speeds in gear boxes.	*2,K1,CO4*
9.	Why heat-dissipation necessary in clutches?	*2,K1,CO5*
10.	What is the difference between the clutch and the brake?	*2,K2,CO6*

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	Design a Flat Belt Drive to transmit 10 kW at 1500 rpm to a line shaft to run at 500 rpm. Approximate centre distance is 2m. The diameter of larger pulley is 750 mm.	*13,K3,CO1*
		OR	
	b)	Design a Chain Drive to actuate a compressor from a 15 kW electric motor at 970 rpm. The compressor speed is 350 rpm. Assume minimum center distance as 550 mm. The chain tension may be adjusted by shifting the motor on rails. The compressor is to work 8 hours a day.	*13,K3,CO1*
12.	a)	Design a pair of Spur Gear Drive to transmit 30 kW power at 1400 rpm. Transmission Ratio is 4. Assume suitable materials.	*13,K3,CO2*
		OR	

b) Design a pair helical gear drive to transmit 10 kW at a pinion speed of 1000 rpm of the pinion. Speed ratio is 5. Take 40 Ni2 Cr1 Mo28 Steel as material for pinion and gear. Assume minimum number of teeth as 20. *13,K3,CO2*

13. a) Design a Bevel Gear Drive to transmit 9 kW at 20 rps of the pinion. Gear ratio is 3. Material for Pinion and Wheel is C20 steel. Life = 10,000 hours. *13,K3,CO3*

OR

b) Design a worm gear drive to transmit a power of 22.5 KW. The worm speed is 1440 rpm and the speed of the wheel is 60 rpm. The drive should have a minimum efficiency of 80% and above. Select suitable materials for the worm and the wheel. *13,K3,CO3*

14. a) A Six Speed Gear Box is to provide a speed range of 100 rpm to 1000 rpm. Draw the Speed Diagram and Kinematic Layout. Also calculate deviations. *13,K3,CO4*

OR

b) A 9 Speed Gear Box is to give output speeds ranging from 100 rpm to 630 rpm. Draw the Structural Diagram and Kinematic Layout. Also calculate deviations. *13,K3,CO4*

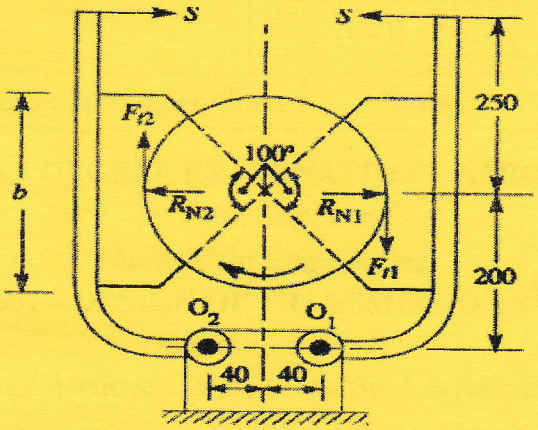
15. a) A plate clutch with maximum diameter 600mm has maximum lining pressure of 0.35 MPa. The power to be transmitted at 400 rpm is 135 KW, n=1 and μ= 0.3. Find inside diameter and spring force required to engage the clutch. Springs with spring index 6 and material spring steel with safe shear stress 600 MPa are used. Find the diameters if 6 springs are used. *13,K3,CO5*

OR

b) A multi disc clutch consists of five steel plates and four bronze plates. The inner and outer diameters of friction disks are 75mm and 150mm respectively. The coefficient of friction is 0.1 and the intensity of pressure is limited to 0.3. N/mm^2. Assuming the uniform wear theory, calculate (i) the required operating force, and (ii) power transmitting capacity at 750 rpm. *13,K3,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) A double shoe brake as shown in Figure 1 is capable of absorbing a torque of 1500 N-m. The diameter of the brake drum is 400 mm and the angle of contact for each shoe is 100°. If the coefficient of friction between the brake drum and lining is 0.4, find (i) the spring force necessary to set the brake and (ii) the width of the brake shoe, if the bearing pressure on the lining material is not to exceed 0.3 N/mm^2. *15,K3,CO6*



All dimensions in mm.

Figure 1

OR

b) A differential band brake (Figure 2) is operated by a lever of length 500 mm. The brake drum has a diameter of 500 mm and the maximum torque on the drum is 1000 N-m. The band brake embraces 2/3rd of the circumference. One end of the band is attached to a pin 100 mm from the fulcrum and the other end to another pin 80 mm from the fulcrum and on the other side of it when the operating force is also acting. Coefficient of friction 0.3, find the operating force. Design the steel band, shaft and key. The permissible stresses may be taken as 70 MPa in tension, 50 MPa in shear and 20 MPa in bearing. The bearing pressure for the brake lining should not exceed 0.2 N/mm^2. *15,K3,CO6*

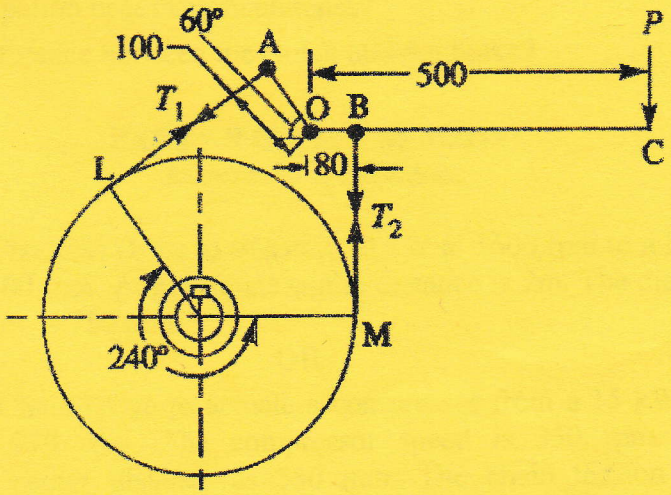


Figure 2