Reg. No.												

Question Paper Code	12197

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2023

Sixth Semester

Mechanical Engineering

20MEPC601 - DESIGN OF TRANSMISSION SYSTEMS

(Use of PSG Design Data Book is permitted.)

(Regulations 2020)

Duration: 3 Hours Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	What are the various losses in the power transmission by belts?	*2,K1,CO1*
2.	What do you understand by 6x9 constructions in wire ropes?	*2,K1,CO1*
3.	In what ways helical gears are differed from spur gears?	*2,K1,CO2*
4.	Why pinion is made harder than gear?	*2,K2,CO2*
5.	In which gear-drive, self-locking is available?	*2,K1,CO3*
6.	Why is the efficiency of worm gear drive low?	*2,K2,CO3*
7.	What is step ratio?	*2,K1,CO4*
8.	What are the basic rules to construct a Ray diagram?	*2,K1,CO4*
9.	Why are cone clutches better than disc clutches?	*2,K1,CO5*
10.	Why heat-dissipation necessary in clutches?	*2,K1,CO5*

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	Select a suitable V-belt drive to connect a 7.5Kw, 1440 rpm induction motor to run a fan at approximately 480 rpm for a service of hr per day. The space available for center distance is 1m.	*13,K3,CO1*
		OR	
	b)	A crane is lifting a load of 18 kN through a wire rope and a hook. The weight of the hook etc. is 10 kN. The load is to be lifted with an acceleration of $1m/s^2$. Calculate the diameter of the wire rope. The rope diameter may be taken as 30 times the diameter of the rope. Take a factor of safety of 6 and Young's modulus for the wire rope 0.8×10^5 N/mm^2. The ultimate stress may be taken as 1800 N/mm^2. The cross-sectional area of the wire rope may be taken as 0.38 times the square of the wire rope diameter.	*13,K3,CO1*

12. a) A motor shaft rotating at 1440 rpm has to transmit 15 kW power to a low speed shaft at 500 rpm. A 20° pressure angle involute tooth gear pinion is used. The pinion has 25 teeth. Both gear and pinion are made of cast iron having allowable strength of 55 N/ mm^2. Design a suitable gear drive. *13,K3,CO2*

OR

b) A pair of helical gear subjected to moderate shock loading is to transmit 20 kW at 1500 rpm of the pinion. The speed reduction ratio is 4 and the helix angle is 20°. The service is continuous and the teeth are 20° full depth in the normal plane. For the gear life of 10,000 hours, design the gear drive. *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 & Wheel C 20 steel. Life = 10,000 hours. *13,K3,CO3*

OR

b) A hardened steel worm rotates at 1440 rpm and transmits 12 kW to a phosphor bronze gear. The speed of the worm wheel should be 60 ± 3% rpm. Design the worm gear drive if an efficiency of at least 82% is desired. *13K3,CO3*

14. a) A 9 Speed Gear Box is to give output speeds ranging from 100 rpm to 630 rpm. Draw the Structural Diagram & Kinematic Layout. *13,K3,CO4*

OR

b) Design the layout of a 12 speed gear box for a lathe. The minimum and maximum speeds are 100 and 1200 rpm. Power is 5 kW from 1440 rpm induction motor. Construct the speed diagram using a standard speed ratio. Calculate the number of teeth in each gear wheel and sketch the arrangement of the gear box. *13,K3,CO4*

15. a) A cone clutch is to transmit 7.5 kW at 900 rpm. The cone has a face angle of 12°. The width of the face is half of the mean radius and the normal pressure between the contact faces is not to exceed 0.9 N/mm^2. Assuming uniform wear and the coefficient of friction between contact faces as 0.2, find the main dimensions of the clutch and the axial force required to engage the clutch. *13,K3,CO5*

OR

b) A multi disk 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/mm2. 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 single block brake, the diameter of drum is 250 mm and the angle of contact is 90°. The operating force of 700 N is applied at the end of lever which is at 250 mm from the centre of the brake block. Determine the torque that may be transmitted. Fulcrum is at 200 mm from the centre of brake block with an offset of 50 mm from the surface of contact. The coefficient of friction is 0.35. *15,K3,CO6*

OR

b) A 360 mm radius Brake drum contacts a single shoe as shown in figure-1and resists a torque of 250 Nm at 500 rpm. The co- efficient of friction is 0.3. Determine *15,K3,CO6*

(i) The normal reaction on the shoe,

(ii) The force to be applied at the lever end for counter clockwise rotation of the drum if e= 0,

(iii) The force to be applied at the lever end for clockwise rotation of the drum if e=42 mm,

(iv)The force to be applied at the lever end for counter clockwise rotation of the drum if e = 42 mm.

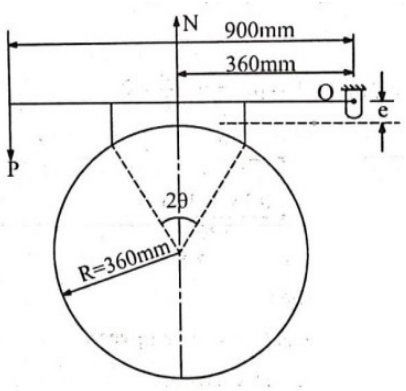

Figure-1