Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, NOV/ DEC 2024

Department of Mechanical Engineering

VI Semester

ME5601 Design of Transmission Systems

(Regulation 2019)

Time: 3hrs. Max. Marks: 100

Upon completion of this course, the students will be able to:

CO 1 Design flexible elements like belt, ropes and chain drives for engineering applications.

CO 2 Design spur and helical gear drives for power transmission.

CO 3 Design bevel and worm drives for power transmission.

CO 4 Design multi speed gear box for machine tool and automotive applications.

CO 5 Design clutch and brake systems for engineering applications.

BL – Bloom's Taxonomy Levels

(L1- Remembering, L2- Understanding, L3- Applying, L4- Analyzing, L5- Evaluating, L6- Creating)

PART- A(10x2=20Marks)

(Answer all the Questions)

Q.No	Questions	Marks	CO	BL
1	Compare: Flexible and rigid drives.	2	1	L2
2	State the limitations of chain drives over belt drives.	2	1	L2
3	What is the relationship between the pitch and circular pitch in a spur gear?	2	2	L2
4	What do you mean by helix angle?	2	2	L1
5	Define: Equivalent number of teeth.	2	3	L1
6	State any two applications where worm gears are employed.	2	3	L2
7	How the sliding mesh achieved in a gear box?	2	4	L2
8	What do you mean by fluid couplings?	2	4	L1
9	Draw a cone clutch and denote the location of cone angle.	2	5	L2
10	Differentiate: Shoe brake and Band brake.	2	5	L2

PART- B(5x 13=65Marks)

Q.No	Questions	Marks	CO	BL
11 (a)	Select a wire rope for a vertical mine hoist to lift a load of 55 kN from a depth of 350 meters. A rope speed of 600 m/min is to be attained in 20 seconds.	13	1	L4
	OR			
11 (b)	An electric motor drives an exhaust fan. The pulley diameters of the motor and fan are 40 cm and 160 cm respectively. The angle of contact between belt and pulleys of motor and fan are 2.5 radians and 3.78 radians respectively. The coefficient of friction between the belt and motor and fan pulleys are 0.3 and 0.25 respectively. The speed of the driver pulley is 700 rpm. Power transmitted by the electric motor is 30 hp. Calculate the width of 5 mm thick flat belt. Take permissible stress for the belt material as 23 kgf/cm^2.	13	1	L4
12 (a)	Design a spur gear to transmit 22.5 kW at 900 rpm; speed reduction is 2.5; Material for pinion and wheel are C15 steel and cast iron grade 30 respectively. Take pressure angle of 20^0 and working life of the gears as 10,000 hrs.	13	2	L4
	OR			

12 (b)	Design a helical gear drive to transmit a power of 15 kW at 1400 rpm to the following specifications speed reduction is 3, pressure angle is 20^0, Helix angle is 15^0, The material of both gears is C45 steel, Allowable static stress is 180 N/mm^2 Young's modulus of the material = 2×10^5 N/mm^2.	**13**	2	L4
13 (a)	Design a bevel gear drive to transmit 10 kW at 2000 rpm for the following data. Gear ratio, 4. Material for pinion and gear, C45 steel, Life =minimum of 10,000 hrs.	**13**	3	L4
OR				
13 (b)	Design a worm gear drive to transmit 25 kW at a worm speed of 1600 rpm. Velocity ratio is 24:1. An efficiency of at-least 87% is desired. The temperature rise should be restricted to 40°C. Determine the required cooling area.	**13**	3	L4
14 (a)	Design a 12 Speed Gear Box. The speed range required is 100 to 355 rpm. Draw the Ray diagram, and the Kinematic arrangement. Also, Calculate the No. of teeth on any two pairs of gears present in first stage.	**13**	4	L4
	OR			
14 (b)	Design a 9 Speed Gear Box for a machine shop application operates between the speed range 400 to 2000 rpm. Calculate the No. of teeth on gears present in thelast stage.Draw the Ray diagram, and the Kinematic arrangement.	**13**	4	L4
15 (a)	A single dry plate clutch is to be designed to transmit 7.5 kW at 900 r.p.m. Find:1. Diameter of the shaft,2. Meàn radius and face width of the friction lining assuming the ratio of themean radius to the face width as four,3. Outer and inner radii of the clutch plate, and4. Dimensions of the spring, assuming that the number of springs are 6 andspring index = 6.The allowable shear stress for the spring wire may be taken as 420 MPa.	**13**	5	L3
	OR			
15 (b)	A single block brake is shown in Figure. The diameter of the drum is 250 mm and the angle of contact is 90°. If the operating force of 700 N is applied at the end of a lever and the coefficient of friction between the drum and the lining is 0.35, determine the torque that may be transmitted by the block brake	**13**	5	L3

PART- C(1x 15=15Marks)

(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16.	Design a chain drive to operate a compressor from a 15 kW electric motor at 900 rpm; The compressor is to run at a speed of 300 rpm; The minimum centre distance should be 550 mm.	**15**	5	L5