KUMARAGURU
college of technology
character is life

B.E/B. TECH DEGREE EXAMINATIONS: APR/MAY 2023

(Regulation 2018)

Sixth Semester

MECHANICAL ENGINEERING

ENTER SUBJECT CODE: **U18MET6004 - Design of Transmission System**

COURSE OUTCOMES

CO1:	Choose suitable flexible drive for specific applications.
CO2:	Design spur and helical gear by considering strength and life.
CO3:	Estimate the dimensions of bevel and worm gears
CO4:	Construct the gearbox for suitable application.
CO5:	Design braking systems for various applications.
CO6:	Apply the concepts of pressure and wear theories to design clutches.

Time: Three Hours	Maximum Marks: 100

Answer all the Questions: -
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

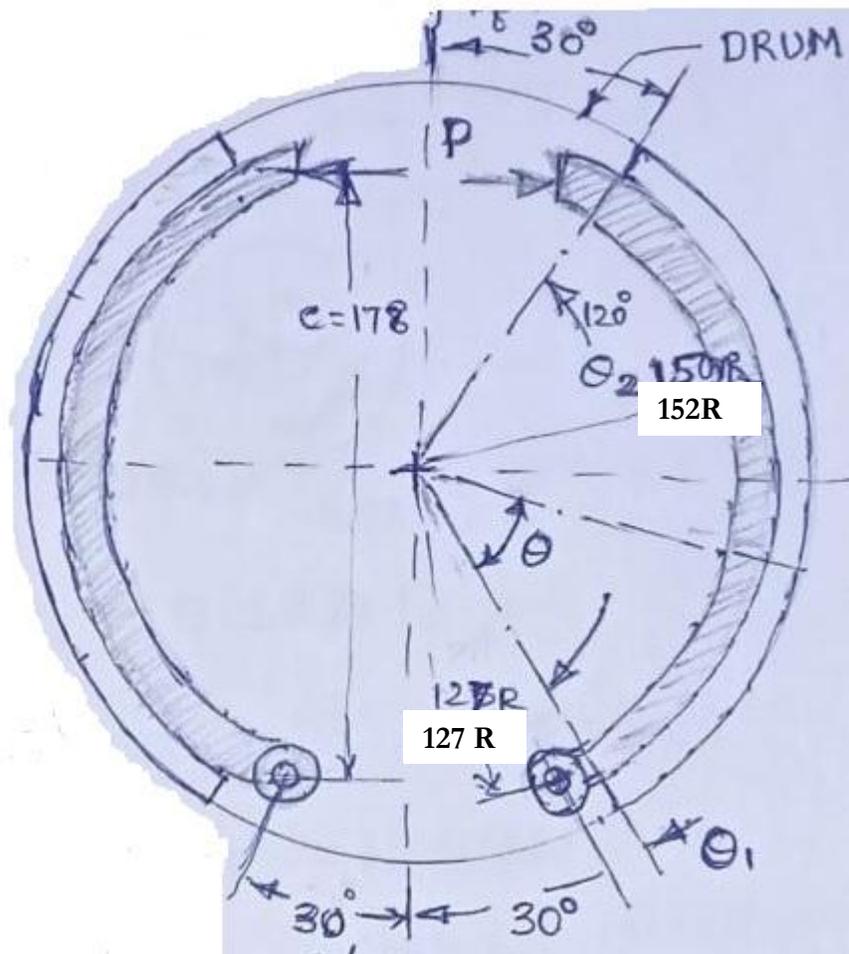|			
1.	Define slip and indicate the slip in the flat belt drive	CO1	[K₁]
2.	Enumerate rope specification	CO1	[K₁]
3.	List the types of gear failure	CO2	[K₂]
4.	Define cone distance	CO3	[K₁]
5.	What are the disadvantages of Worm gear drive	CO3	[K₂]
6.	Compare sliding mesh and synchromesh gearbox	CO4	[K₁]
7.	What is the self-locking brake	CO5	[K₁]
8.	Brief the working of disc brake	CO5	[K2]
9.	What is the effect of temperature in multi-disc clutches	CO6	[K₁]
10.	Name the different friction materials used in friction clutches.	CO6	[K₁]

Answer any FIVE Questions: -
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	a)	Determine the Length and Actual center distance of the V belt drive running 16 hrs./day. An induction motor at 1440 rpm drives the fan at 480 rpm. Assume the available space for the approximate center distance is 1000 mm.	8	CO1 [K₃]

	b)	Select a suitable chain to drive a pump and fix the pitch, suitable centre distance, length of the chain and pitch circle diameter of the pinion and sprocket for the given data. Power – 15 kW, Motor rpm – 1425, Pump rpm – 600, Distance between motor and pump -750 mm.	**8**	CO1 [K₃]
12.	a)	Calculate the Centre distance and module of a spur gear drive. Transmitted power 10 kW. Pinion speed 900 rpm. Speed ratio is 2. The gears are to be made of C45 steel. Life =10,000 hours. Check for the induced stresses σ_b, σ_c of the gear drive	**8**	CO2 [K₃]
	b)	A 30 kW power is to be transmitted by a helical gear set having speed ratio = 2, The driver gear runs at 1000 rpm, helix angle=10 degrees, and Pressure angle=14.5 degrees. Find the material, center distance, module, and width of the gears for the life of 10,000 hrs.	**8**	CO2 [K₃]
13.	a)	A 15 kW motor running at 1120 rpm drive a compressor at 650 rpm through a 90 degree bevel gearing. The pinion has 27T , Pressure angle=20 degree, Material=Cast iron grade 35. Determine Cone distance, Traverse module, and width of the gears by selecting suitable Compressive and bending stress from the table.	**8**	CO3 [K₃]
	b)	Design a Worm gear drive to transmit 22.5 kW at a speed of worm1440 rpm. The velocity ratio is 24:1. Assume efficiency=85%, Find the centre distance, Axial module, and actual compressive stress σ_c.	**8**	CO3 [K₃]
14.		Draw a gearbox's ray diagram and a kinematic layout diagram, giving the speed range from 280 rpm to 1800 rpm in 9 steps. The power of the gearbox is 7.5 kW at 1400 rpm. Calculate the number of gears required and the teeth of all the gears.	**16**	CO4 [K₃]
15.	a)	Calculate the actuating force and torque required to operate an internal expanding shoe brake shown in the diagram. The face width of the shoe is 50mm, μ=0.35, max. intensity of pressure=1.5 N/mm2, Assume Θ1 = 0 degree.	**8**	CO5 [K₃]

Please indicate knowledge level (K₁toK₆) and Course Outcome level (CO1 to CO5) against each question for each subdivision.

	b)	A Band brake assembly has a drum diameter of 560 mm, a band/ drum coefficient of friction=0.35, angle of contact= 240degrees, one end of the band is attached to the fulcrum pin as the other end is fitted at 200 mm from the fulcrum. Find the force applied at 660 mm from the fulcrum when a torque developed is 385 N.m.	8	CO5	[K$_3$]
16.	a)	Determine the operating force and power transmitting capacity of a multi-disk clutch that has the following design parameters. 4 steel plates and 3 bronze plates, the inside radius is 100 mm, and the width of the clutch contact surface is 50 mm, the thickness of the plates is 4.76 mm, μ=0.15, pressure intensity is 0.3 N/mm2, uniform wear theory to be assumed. Also, find the power transmitting capacity at 900 rpm.	8	CO6	[K$_3$]

Please indicate knowledge level (K$_1$toK$_6$) and Course Outcome level (CO1 to CO5) against each question for each subdivision.

b)	Determine the axial force and diameters of a cone clutch that has the following design parameters. The larger diameter is 304 mm, the semi-cone angle is 15 degrees, $\mu=0.2$ operating speed is 1000rpm and the power is 38 kW. Assume suitable pressure intensity.	**8**	CO6	[K$_3$]

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Please indicate knowledge level (K$_1$toK$_6$) and Course Outcome level (CO1 to CO5) against each question for each subdivision.