

Reg. No.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

B. E / B. TECH.DEGREE EXAMINATION, MAY 2023

Sixth Semester

ME18602 – DESIGN OF TRANSMISSION SYSTEMS

(Mechanical Engineering)

(Use of Approved Data book is permitted)

(Assumptions and assumed data have to be stated clearly)

(Regulation 2018)

TIME:3 HOURS

MAX. MARKS: 100

- CO1 The students will apply procedures to design the belt and chain drives.
- CO2 The students will apply the design procedure for spur and helical gear drives using the manufacturer’s catalogue.
- CO3 The students will analyze the bevel and worm gear drive design by adopting the manufacturer’s catalogue
- CO4 The students will design the gear box by adopting the design procedures.
- CO5 The students will design the clutches and brakes using the laws of friction.

PART- A (10x2=20Marks)

(Answer all Questions)

	CO	RBT LEVEL
1. What is the effect of Centre distance and diameter of pulley on the life of a belt?	1	3
2. What is to be done to accommodate initial sag in chain drives?	1	3
3. What are the commonly used gear tooth profiles?	2	3
4. Why is a gear tooth subjected to dynamic loading?	2	2
5. When bevel gears are used? and state the forces acting on bevel gears	3	2
6. Why the efficiency of worm gear drive is comparatively low?	3	3
7. What situation demands the use of gear box? List any two methods used for changing speeds in gear box.	4	2
8. What does the ray diagram of gear box indicates?	4	2
9. How the “uniform rate of wear” assumption is valid and preferable for clutches?	5	3
10. How does the function of a brake differ from that of a clutch?	5	2

PART- B (5x 14=70Marks)

	Marks	CO	RBT LEVEL
11. (a) A V-belt drive is to transmit 40KW in a heavy duty saw mill which works in two shifts of 8 hours each. The speed of motor shaft is 1440 rpm with the approximate speed reduction of 3 in the machine shaft. Design the drive.	(14)	1	3

- (OR)
- (b) Design a chain drive to run a compressor from an 11 KW electric motor running at 970 rpm, the compressor speed being 330 rpm. The compressor operates 16 hr per day. The center distance should be approximately 500mm. The chain tension can be adjusted by shifting the motor on slides. (14) 1 3
- 12. (a) Design a spur gear pair to transmit 5kW at 1440 rpm from an electric motor to an air compressor running at 720rpm. Take working life as 10,000 hrs. Both the gears are made of the C45 steel. (14) 2 3
- (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. (14) 2 3
- 13. (a) Design a pair of right-angled bevel gears to transmit 15 kW at 750 rpm to another gear to run at 250 rpm. Not less than 20 teeth are to be used on either gear. The pressure angle is 20°. Assume a gear life of 12000 hrs. (14) 3 3
- (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. (14) 3 3
- 14. (a) Design a 9-speed gear box for drilling machine for the following inputs. Minimum speed is 100 rpm and the recommended step ratio is 1.25. Draw the speed diagram, kinematic diagram. (14) 4 3
- (OR)
- (b) Design the layout of a 12 speed gear box for a crushing machine tool application having an output of speeds ranging from 100 to 355 rpm. Choose standard step ratio and construct the speed diagram and kinematic diagram. (14) 4 3
- 15. (a) A single plate clutch transmits 25kW at 900 rpm. The max. intensity of pressure between the plates is 85 N/mm². The ratio of radii is 1.25. Both side of the plates are effective and the coefficient of friction is 0.25. determine (i) the inner diameter of the plate. (ii)the axial force to engage the clutch. Assume the theory of uniform wear. (14) 5 3
- (OR)
- (b) A 360 mm radius Brake drum contacts a single shoe as shown in Figure15 b and resists a torque of 250 Nm at 500 rpm. The co-efficient of friction is 0.3. Determine (i) The normal reaction on the shoe, (ii) The force to be applied at the lever end for counterclockwise rotation of the drum if e is 0, (14) 5 3

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

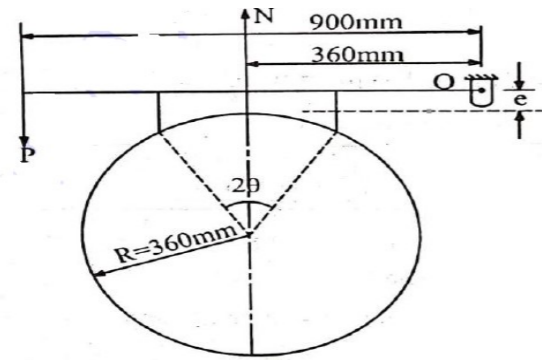


Figure15 b

PART- C (1x 10=10Marks)
(Q.No.16 is compulsory)

16. For construction of slotting machine tool, a six-speed gear box is required to provide output speeds in the range of 125 to 400 rpm, as per the need of end user. The Renard series of R(10) is recommended by design team, to arrive at six levels of speeds. To meet the functional requirement, the committed power for transmission from motor is of 5 kW at a speed of 710 rpm. Design and detail the speed diagram, kinematics diagram and number of teeth required.

Marks	CO	RBT LEVEL
(10)	4	3