

Reg. No. :

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

**Question Paper Code : C 1383**

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2010.

Sixth Semester

Mechanical Engineering

ME 1352 — DESIGN OF TRANSMISSION SYSTEMS

(Common to B.E. Part Time – Fifth Semester Mechanical Engineering –  
Regulation 2005)

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Usage of approved design data book is permitted.

Assumptions and assumed data have to be stated clearly.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How are the ends of flat- belt joined?
2. What are the five parts of roller chain?
3. Why is tangential component of gear tooth force called useful component?
4. Compare the contact between mating teeth of spur and helical gears.
5. When do we employ crossed helical gear?
6. Mention two characteristics of hypoid gear.
7. List the ways by which the number of intermediate steps may be arranged in a gear box.
8. What are the points to be considered while designing a sliding-mesh type of multi-speed gear box?

9. What is the disadvantage of block brake with one short shoe? What is the remedy?
10. When do we use multiple disk clutches?

## PART B — (5 × 16 = 80 marks)

11. (a) Design a flat belt drive to transmit 6 kW at 900 rpm of the driver pulley. Speed reduction is to be 2.5:1. Assume that the service is 16 hours a day. (16)

Or

- (b) Design a chain drive to transmit 6 kw at 900 rpm of a sprocket pinion. Speed reduction is 2:5:1. Driving motor is mounted on an adjustable base. Assume that load is steady, drive is horizontal and service is 16 hours/day. (16)
12. (a) The pitch circles of a train of spur gears are shown in Fig. 1. Gear A receives 3.5 kW power at 700 rpm through its shaft and rotates in clockwise direction. Gear B is the idler gear while gear C is the driven gear. The number of teeth on gears A, B and C are 30, 60 and 40 respectively, while the module is 5 mm. Calculate the torque on each gear shaft; and the components of gear tooth forces.

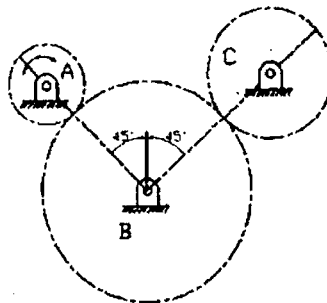


Fig. 1

Draw a free-body diagram of forces and determine the reaction on the idler gear shaft. Assume the 20° involute system for the gears. (16)

Or

- (b) A pair of helical gears is to transmit 14 kW. The teeth are 20° stub and helix angle is 45°. Pinion runs at 10,000 rpm and has 80 mm PCD. Wheel has 320 mm PCD. Both gears are made of cast steel. Design the gear pair and obtain the basic dimensions assuming a life of 1000 hours.

13. (a) Design a pair of cast iron bevel gears for a special purpose machine tool to transmit 3.5 kW from a shaft at 500 rpm to another at 800 rpm. The gears overhang in their shafts. Life required is 8000 hours. (16)

Or

- (b) Design a worm gear drive with a standard centre distance to transmit 7.5 kW from a worm rotating at 1440 rpm to a worm wheel at 20 rpm. (16)
14. (a) An all geared speed gear box is to be designed for a radial drilling machine with the following specifications :
- Maximum size of the drill to be used = 50mm  
Minimum size of the drill to be used = 10mm  
Maximum cutting speed (drilling) = 40 m/min.  
Minimum cutting speed (reaming, tapping, and boring) = 6m/min.  
Number of speeds = 12
- Choose a  $3 \times 2 \times 2$  arrangement. Sketch the layout of the gearbox and the speed diagram. Calculate the percentage deviation of the obtainable speeds from the calculated ones. (16)

Or

- (b) Sketch three possible ray diagrams for a 6-speed gear box with  $2 \times 3$  arrangement. Choose the best possible ray diagram. Give suitable explanation for the same. (16)
15. (a) The displacement specifications of follower are given below :
- Stroke of the follower 25 mm  
Outstroke takes place with SHM during  $90^\circ$  of cam rotation  
Return stroke takes place with SHM during  $75^\circ$  of cam rotation  
Cam rotates with a uniform speed of 800 rpm.
- Determine the induced contact stress, assuming follower mass as 0.25 kg and spring stiffness as 100 N/mm, when the cam rotation is  $15^\circ$ . Take the thickness of the plate cam as 10 mm. The base circle radius and the follower roller radius are 25 mm and 10 mm respectively. Material used is steel. (16)

Or

- (b) A block brake with a short shoe is shown in Fig. 2. It is to be designed so that the product 'pv' is limited to 2, where 'p' is the normal pressure between friction lining and the brake drum (N/mm<sup>2</sup>) and 'v' is the peripheral velocity of brake drum (m/s).

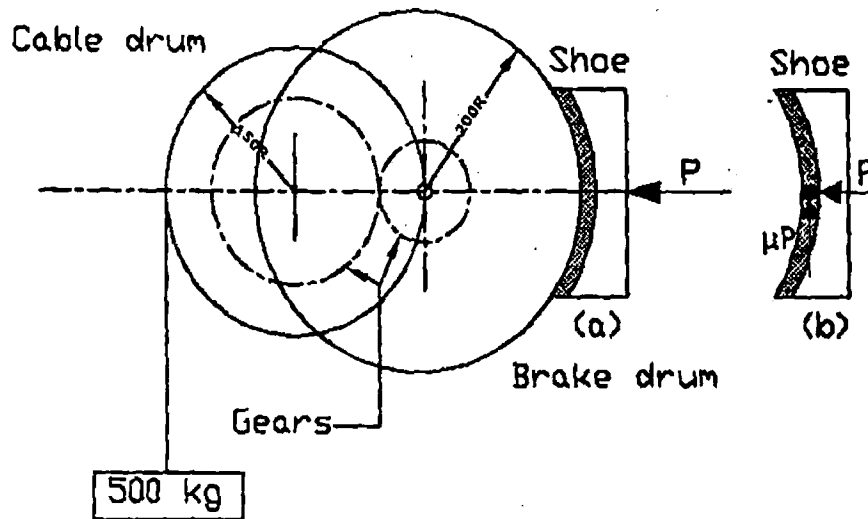


Fig. 2

The coefficient of friction between the brake drum and the friction lining is 0.2. The cable drum is connected to the brake drum by means of a pair of spur gears. The brake drum rotates four times as fast as the cable drum. The permissible intensity of pressure on friction lining is  $1 \text{ N/mm}^2$ . Calculate :

- (i) The magnitude of the brake shoe force ( $P$ ). (6)
- (ii) The area of friction lining. (4)
- (iii) The uniform velocity at which the mass can be lowered. What happens at higher speeds? (6)