Reg. No. : | | | | | | | | | | | |

C 3384

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2008.

Sixth Semester

Mechanical Engineering

ME 1352 — DESIGN OF TRANSMISSION SYSTEMS

(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 — ($10 \times 2 = 20$ marks)

1. List out the losses in belt drives.

2. How do you specify a wire rope? Give an example.

3. State two advantages of $14\frac{1}{2}°$ involute system in gear drives.

4. A pair of helical gears consists of a 25 teeth pinion meshing with 50 teeth gear. The normal module is 4 mm. Find the required value of the helix angle if the centre distance is exactly 165 mm.

5. What is a zerol bevel gear?

6. What is meant by a single-enveloping worm drive?

7. The speeds in machine tool gear boxes are in geometric progression. Why?

8. What are preferred numbers?

9. How will you reduce the pressure angle in cam design?

10. List out any four required qualities of a good friction material.

PART B — (5 × 16 = 80 marks)

11. (a) A 2.5 kW of power is transmitted by an open belt drive. The linear velocity of the belt is 2.5 m/s. The angle of lap on the smaller pulley is 165°. The co-efficient of friction is 0.3. Determine the effect on power transmission in the following cases :

(i) Initial tension in the belt is increased by 8%,

(ii) Initial tension in the belt is decreased by 8%,

(iii) Angle of lap is increased by 8% by the use of an idler pulley, for the same speed and the tension on the tight side, and

(iv) Co-efficient of friction is increased by 8% by suitable dressing to the friction surface of the belt. Also state which of the above methods suggested could be more effective?

Or

(b) The transporter of a heat treatment furnace is driven by a 4 kW, 1440 rpm, induction motor through a chain drive with a speed reduction ratio of 2.4. The transmission is horizontal with bath type of lubrication. Rating is continuous with 3 shifts per day. Design the complete chain drive assuming simplex type and centre distance of approximately 500 mm.

12. (a) A train of spur gears is shown in Fig. 1. Pinion 1 runs at 1750 rpm and transmits 2.5 kW power to idler gear 2. The teeth are cut on the 20° full depth system and have a module of 2.5 mm. The number of teeth on gears 1, 2 and 3 are 20, 50 and 30 respectively. Calculate :

(i) the torque on each gear shaft and

(ii) the components of gear tooth forces.

Also draw a free body diagram of gear 2 showing all the forces which act upon it and determine the reaction on the idler gear shaft.

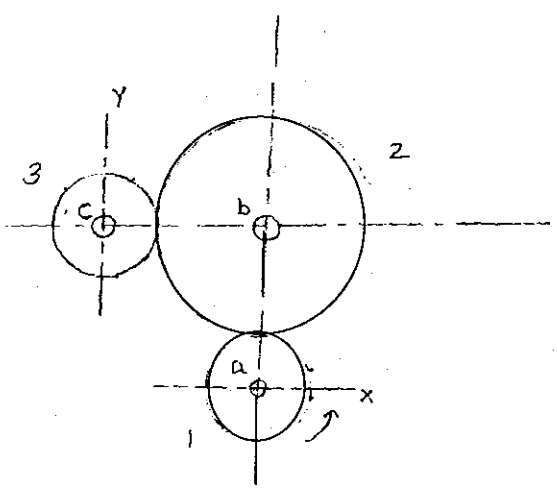

Fig.1

Or

(b) For intermittent duty of an elevator, two cylindrical gears have to transmitt 10 kW at a pinion speed of 1200 rpm. Design the gear pair for the following specifications : Gear ratio 3.5, pressure angle 20°, involute full depth, helix angle 15°. Gears are expected to work 6 hours a day for 10 years. Use alloy steel 40 Ni 2 Cr 1 M_o 28 for both pinion and gear.

13. (a) Design a bevel gear drive to transmit 3.5 kW Speed ratio = 4. Driving shaft speed = 200 rpm. The drive is non-reversible. Pinion is of steel and wheel of CI. Assume a life of 25000 hours.

Or

(b) (i) In a spiral gear drive connecting two shafts, the approximate centre distance is 400 mm and the speed ratio is 3. The angle between the two shafts is 50° and the normal pitch is 18 mm. The spiral angles for the driving and driven wheels are equal. Find,

(1) Number of teeth on each wheel

(2) Exact centre distance and

(3) Efficiency of the drive, if friction angle = 6°. (10)

(ii) A double threaded worm has a lead of 65 mm. The gear has 42 teeth and is cut with a hob of module 8 mm perpendicular to the teeth. Find the pitch diameters of the worm and gear, and the centre distance of the shafts. (6)

14. (a) A nine speed gear box, used as a head stock gear box of a turret lathe, is to provide a speed range of 180 rpm to 1800 rpm. Using standard step ratio, draw the speed diagram, and the kinematic layout. Also find and fix the number of teeth on all gears.

Or

(b) A 14 speed gear box is required to furnish output speeds in the range of 125 to 2500 rpm. Draw the speed diagram and the kinematic arrangement.

15. (a) A leather faced conical friction clutch has a cone angle of 30°. The intensity of pressure between the contact surface is not to exceed 6×10^4 N/m^2 and the breadth of the conical surface is not to be greater than 1/3 of the mean radius, if μ = 0.20 and the clutch transmits 37 kW at 2000 rpm. Find the dimensions of contact surface. Assume a service factor of 2.5.

Or

(b) Derive an expression for the braking torque considering a single shoe brake. Explain self-locking and self-energising brakes.
