A 1387

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Sixth Semester

Mechanical Engineering

ME 342 — DESIGN OF TRANSMISSION SYSTEM

Time : Three hours

Maximum : 100 marks

(Approved Design Data Book is permitted)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. In what way the timing belt is superior to ordinary belt?

2. State the law of gearing.

3. What is the use of a clutch in power transmission system?

4. State the advantage of herringbone gear.

5. Derive an expression for tension ratio in a belt drive.

6. Name the different friction materials used in friction clutches.

7. Draw the ray diagram for a six speed gear box.

8. Name the different applications of Worm gear.

9. Sketch a cone clutch.

10. What do you understand by simplex, duplex and triplex chain?

PART B — (5 × 16 = 80 marks)

11. (a) Design a chain drive to actuate a compressor from 15 kW electric motor running at 1,000 r.p.m, the compressor speed being 350 rpm. The minimum centre distance is 500 mm. The compressor operates 15 hours per day. The chain tension may be adjusted by shifting the motor. (16)

Or

(b) Design a V-belt drive and calculate the actual belt tension and average stress for the following data. Driven pulley diameter, D = 500 mm, Driver pulley diameter, d = 150 mm, center distance c = 925 mm, speed n_1 = 1000 rpm, n_2 = 300 rpm and power, P = 7.5 kW.

12. (a) A leather belt 9 mm × 250 mm is used to drive a cast iron pulley 900 mm in diameter at 336 rpm. If the active arc on the smaller pulley is 120° and stress in tight side is 2 MPa, find the power capacity of the belt. The density of the leather may be taken as 980 kg/m³ and coefficient of friction of leather on cast iron is 0.35. (16)

Or

(b) Design a straight spur gear drive to transmit 8 kW. The pinion speed is 720 rpm and the speed ratio is 2. Both the gears are made of the same surface hardened carbon steel with 55 RC and core hardness less than 350 BHN. Ultimate strength is 720 N/mm² and yield strength is 360 N/mm².

13. (a) Design a pair of bevel gears for two shafts whose axes are at right angles. The power transmitted is 25 kW. The speed of the pinion is 300 rpm and the gear is 120 rpm.

Or

(b) Design a nine-speed gear box for a machine to provide speeds ranging from 100 to 1500 rpm. The input is from a motor of 5 kW at 1440 rpm. Assume any alloy steel for the gear. (16)

(a) Design a worm gear drive to transmit 22.5 kW at a worm speed of 1440 rpm. Velocity ratio is 24 : 1. An efficiency of atleast 85% is desired. The temperature rise should be restricted to 40° C. Determine the required cooling area. (16)

Or

(b) A 90° degree straight bevel gear set is needed to give a 3 : 1 reduction. Determine the pitch cone angle, pitch diameter, and gear forces if the, 25 degree pressure angle pinion has 15 teeth of pitch circle diameter, 4, and the transmitted power is 8 HP at 550 pinion rpm.

15. (a) Find the torque that a two surface, dry disk clutch can transmit if the outside and inside lining diameters are 120 mm and 70 mm, respectively, and the applied axial force is 10 kW. Assume uniform wear and $\mu = 0.4$. Is the pressure on the lining acceptable? What lining material would be suitable? (16)

Or

(b) In a single block brake, the diameter of the drum is 250 mm and the angle of contact is 90°. The operating force of 700 N is applied at the end of lever which is at 250 mm from the center of the brake block. The coefficient of friction between the drum and the lining is 0.35. Determine the torque that may be transmitted. Fulcrum is at 200 mm from the centre of brake block with an offset of 50 mm from the surface of contact.

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