C 3307

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

Sixth Semester

(Regulation 2004)

Mechanical Engineering

ME 1352 — DESIGN OF TRANSMISSION SYSTEMS

(Common to BE (Part-Time) Fifth Semester – Regulation 2005)

Time : Three hours　　　　　　　　　　　　　　　Maximum : 100 marks

Usage of PSG Design Data Book is permitted in the University Examination.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is done to accommodate initial sag in chain drive?

2. How is a wire rope specified?

3. Label (a) Addendum (b) Flank in a simple sketch of a gear tooth.

4. What are the commonly used gear tooth profiles?

5. When bevel gears are used?

6. What are commonly used materials for worm and wheel?

7. What is step ratio? Name the series in which speeds of multi-speed gear box are arranged.

8. Give some applications of constant mesh gear box.

9. Name the profile of cam that gives no jerk.

10. Give the reason for left and right shoes of the internal expansion brakes having different actuating forces.

PART B — (5 × 16 = 80 marks)

11. (a) A V-belt drive is required to transmit 16 kW power to a compressor. The motor speed is 1440 rpm and the speed reduction ratio is 3.6. Design the belt drive. Sketch the details of pulley.

Or

(b) A crane is used to lift a load of 32 kN through a wire rope. Weight of crane hook is 6 kN. The load is to be lifted with an acceleration of 1.2 m/s². Neglecting self weight of the rope, design the drive.

12. (a) A motor shaft running at 1440 rpm has to transmit is kW power to a low speed shaft rotating at 480 rpm. The pinion has 25 teeth. Both pinion and gear are made of C45 steel. Design a suitable spur gear drives.

Or

(b) Design a pair of helical gears to transmit 30 kW at a speed reduction ratio of 4:1. The input shaft runs at 2000 rpm. Both pinion and gear are 15Ni2crlMol5 under carburized Condition.

13. (a) A pair of straight bevel gears is mounted on shafts, which are intersecting at right angles. The pinion shaft is connected to an electric motor developing 16.5 kW, at 500 rpm. The gear should run at 200 rpm. Design the drive.

Or

(b) Design a worm gear drive for the following data:

Power to be transmitted : 20 kW, Worm speed: 1440 rpm, Speed reduction: 24:1.

14. (a) Design a 9 speed gear box for the following data:

Minimum speed: 100 rpm, Step ratio: 1.25. The input is from a4 kW, 1400 rpm motor. Draw the speed diagram and indicate the number of teeth on each gear in a kinematic diagram

Or

(b) Select speeds for a 12 speed gear box for a minimum speed of 16 rpm and maximum speed of 900 rpm. Draw a kinematic arrangement of the gear box showing the number of teeth.

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15. (a) A plate clutch has 3 discs on the driving shaft and 2 discs on the driven shaft, providing 4 pairs of contact surfaces. The outside diameter of the contact surfaces is 240 mm and inside diameter 120 mm. Assuming uniform pressure and $\mu = 0.3$, find the total spring load for pressing the plates together to transmit 25 kW at 1575 rpm. If there are 6 springs each of stiffness 13 kN/m and each of the contact surfaces have worn away by 1.25 mm, find the maximum power that can be transmitted, assuming uniform wear.

Or

(b) Design a cam for operating the exhaust valve of an oil engine. It is required to give equal uniform acceleration and retardation during opening and closing of the valve, each of which corresponding to 60° of cam rotation. The valve should remain in the fully open position for 20° of cam rotation. The lift of the valve is 37.5 mm and the least radius of the cam is 50 mm, the follower is provided with a roller of 50 mm diameter and its line of stroke passes through the axis of the cam.