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Question Paper Code : S 4713

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2009.

Sixth Semester

Mechanical Engineering

ME 342 — DESIGN OF TRANSMISSION SYSTEM

(Regulation 2001)

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 silent chain is better than ordinary driving chain?

2. What are the various losses in the power transmission by belts?

3. What is interference in involute profile?

4. What are the factors that influence backlash in gear drives?

5. How does the number of teeth affect the design of gears?

6. Where do we use skew helical gears?

7. In which gear-drive, self-locking is available?

8. What is the function of spacers in a gear-box?

9. What is meant by a self-energising brake?

10. What are the desirable properties of friction material to be used for clutches?

PART B — (5 × 16 = 80 marks)

11. (a) A motor shaft rotating at 1440 rpm has to transmit 15 kW power to a low speed shaft rotating at 500 rpm. A 20° pressure angle involute tooth gear pinion is used. The pinion has 25 teeth. Design a suitable gear drive. (16)

Or

(b) Design a belt drive to transmit 110 kW for a system consisting of two pulleys of diameter 0.9 m and 1.2 m, centre distance of 3.6 m, a belt speed 20 m/s, coefficient of friction 0.3, a slip of 1.2 % at each pulley and 5% friction loss at each shaft, 20 % over load. (16)

12. (a) Design a chain drive to actuate a compressor from a 12 kW electric motor at 900 rpm, the compressor being 250 rpm. Minimum centre distance should be 500 mm. The chain tension may be adjusted by shifting the motor on rails. The compressor is to work 8 hours/day. (16)

Or

(b) A bronze spur pinion rotating at 600 rpm drives a cast iron spur gear at a transmission ratio 4:1. The allowable static stresses for the bronze pinion and cast iron gear are 84 MPa and 105 MPa respectively.

The pinion has 16 standards 20° full depth involute teeth of module 8 mm. The face width of both the gears is 90 mm. Find the power that can be transmitted from the stand point of strength. (16)

13. (a) An electric motor is to be connected to a reciprocating pump through a gear pair. The gears are overhanging in their shafts. Motor speed = 1440 rpm. Speed reduction ratio = 5. Motor Power = 36.8 kW. The gears are to have 20° pressure angle. Design a spur gear drive. (16)

Or

(b) Design the teeth of a pair of bevel gear to transmit 18.75 kW at 600 rpm of the pinion. The velocity ratio should be about 3 and the pinion should have about 20 teeth which are full depth 20° involute. Find the module, face width, diameter of the gears and pitch core angle for both gears. (16)

14. (a) Design a warm gear drive with a standard centre distance to transmit 7.5 kW from a warm rotating at 1440 rpm to a warm wheel at 20 rpm. (16)

Or

(b) A micarta pinion at 1200 rpm is to transmit 1 kW to a cast iron gear at a speed of 192 rpm. Assuming a starting overload of 20% and using 20° full depth involute teeth, determine the module, number of teeth on the pinion and gear and face width. Take allowance static strength for micarta as 40 MPa and for cast iron as 53 MPa. Check the pair in wear. (16)

15. (a) A rope drum of an elevator having 650 mm diameter is fitted with a brake drum of 1 m diameter. The brake drum is provided with four cast iron brake shoes each subtending an angle of 45°. The mass of the elevator when loaded is 2000 kg and moves with a speed of 2.5 m/s. The brake has a sufficient capacity to stop the elevator in 2.75 meters. Assuming the coefficient of friction between the brake drum and shoes as 0.2, find

(i) Width of the shoe, if the allowable pressure on the brake shoe is limited to 0.3 N/mm^2 and

(ii) Heat generated in stopping the elevator. (16)

Or

(b) A single plate clutch, effective on both sides is required to transmit 25 kW at 3000 rpm. Determine the outer and inner diameter of frictional surface if the coefficients of friction is 0.255, ratio of diameters is 1.25 and maximum pressure is not to exceed 0.1 N/mm^2. Also determine the axial thrust to be provided by springs. Assume the theory of uniform wear. (16)