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Question Paper Code : 21043

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2012.

Sixth Semester

Mechanical Engineering

080120034 – DESIGN OF TRANSMISSION SYSTEMS

(Regulation 2008)

Time : Three hours

Maximum : 100 marks

Use of approved Design Data Book permitted.

Any missing data may be suitably assumed.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How is a wire rope specified? Give an example.
2. Mention the parts of roller chain.
3. Why is pinion made harder than gear?
4. Compare the features of spur and helical gears.
5. When do we employ crossed helical gear?
6. Mention the types of failure in worm gear drives.
7. List four applications where constant mesh gear box is used.
8. What are the conditions required for interchangeability in toothed gears?
9. What is a self-locking brake?
10. Distinguish between a coupling and a clutch.

PART B — (5 × 16 = 80 marks)

11. (a) Select a suitable chain to transmit 15 kW at 1000 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 12 hours/day.

Or

- (b) A belt is to transmit 25 kW at 720 rpm to a rolling machine with a speed ratio of 3. Center distance between the pulleys is 2.8 m. Design a suitable belt drive if the rolling machine pulley diameter is 0.9 m.

12. (a) Design a spur gear drive to transmit 10 kW at 1440 rpm, speed reduction is 3. Take pressure angle as 20° and working life of the gears as 15,000 hrs. Assume the materials for pinion and wheel as heat treated cast steel and high grade cast iron respectively.

Or

- (b) Deduce the expressions for forces acting on a gear tooth of a helical gear with the aid of a schematic diagram.

13. (a) A pair of bevel gears is to be used to transmit 8 kW from a pinion rotating at 240 rpm to a gear mounted on a shaft which intersects the pinion shaft at an angle of 70° . Assuming that the pinion is to have an outside pitch diameter of 180 mm, a pressure angle of 20° , a face width of 30 mm, and the gear shaft is to rotate at 80 rpm, determine the forces on the gears and the torque produced about the shaft axis.

Or

- (b) Design a worm gear drive for a speed reducer to transmit 15 kW at 1440 rpm of the worm shaft. The desired wheel speed is 60 rpm. Select suitable worm and wheel materials.

14. (a) A nine speed gear box is to be designed with a minimum speed of 280 rpm and a maximum speed of 1800 rpm. The motor speed is 1400 rpm. Sketch the layout of the gear box and draw the ray diagram. Determine the number of teeth in the gears.

Or

- (b) A gear box is to be designed for the following specifications :

Power to be transmitted = 12 kW. Number of speeds = 18. The minimum speed and motor speed are 16 rpm and 1400 rpm respectively. Step ratio is 1.25. The 18 speeds are obtained as $2 \times 3 \times 3$. Sketch the layout of the gear box and draw the speed diagram.

15. (a) A square threaded bolt of 25 mm nominal diameter and 5 mm pitch is tightened by screwing a nut, whose mean diameter of the bearing surface is 35 mm. If the coefficient of friction for the nut and bolt is 0.12, and for the nut and bearing surface is 0.15, determine the force required at the end of a 250 mm long spanner, when the load on the bolt is 12 kN.

Or

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- (b) Determine the number of discs required and the maximum intensity of pressure developed considering a multiple plate clutch with both sides being effective. The clutch transmits 25 kW at 600 rpm. An axial load of 500 N is applied. The inner and outer radii of the clutch discs are 80 mm and 180 mm respectively. The effective coefficient of friction is 0.3. Assume uniform wear condition.
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