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Question Paper Code : A 3839

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2010.

Sixth Semester

Mechanical Engineering

ME 342 — DESIGN OF TRANSMISSION SYSTEMS

(Regulation 2001)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Sketch and name the different types of compound wire ropes.

2. What is meant by chordal action in chain drives?

3. Sketch the profile of spur gear and mark terminology used to specify the gear.

4. What is beam strength of spur gear? What is the effect of module on beam strength of a tooth in a spur gear?

5. Clutches are usually designed on the basis of uniform wear. Why?

6. What is Lewis (tooth) form factor?

7. Define geometric progression.

8. What is meant by ray diagrams?

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 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 leather may be taken as 980 kg/m^3 and coefficient of friction of leather on cast iron is 0.35. (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. (16)

12. (a) It is required to design a leather crossed belt drive to connect 7.5 kW, 1440 rpm electric motor to a compressor running at 480 rpm. The distance between the centers of the pulleys is twice the diameter of the bigger pulley. The belt should operate at 20 m/s approximately and its thickness is 5 mm. Density of leather is 950 kg/m^3 and permissible stress is 5.6 MPa. Give the design. (16)

Or

(b) Design a chain drive to run a compressor from a 11 kW electric motor running at 970 rpm, the compressor speed being 330 rpm. The compressor operates 16 hours/day. The centre distance should be approximately 500 mm. The chain tension can be adjusted by shifting the motor on slides. (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.

Or

(b) A pair of helical gears subjected to moderate shock loading is to transmit 37.5 kW at 1750 r.p.m. of the pinion. The speed reduction ratio is 4.25 and the helix angle is 15°. The service is continuous and the teeth are 20°FD in the normal plane. Design the gears, assuming a life of 10,000 hours.

14. (a) In a milling machine, 18 different speeds in the range of 35 rpm and 650 rpm are required. Design a three stage gear box with a standard step ratio. Sketch the layout of the gear box, indicating the number of teeth on each gear. The gear box receives 3.6 kW from an electric motor running at 1,440 rpm. Sketch also the speed diagram.

Or

(b) Design a pair of helical gears to transmit 30 kW power at a speed reduction ratio of 4:1. The input shaft rotates at 2000 rpm. Take helix and pressure angles equal to 25° and 20° respectively. The number of teeth on the pinion may be taken as 30.

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 u = 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.