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Question Paper Code : 98049

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Sixth Semester

Mechanical Engineering

080120034 — DESIGN OF TRANSMISSION SYSTEMS

(Regulations 2008)

Time : Three hours

Maximum : 100 marks

PSG Design data book permitted for the calculation purpose.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Name the types of belts used for transmission of power.
2. List out the various stresses induced in the wire ropes.
3. What is meant by diametral pitch?
4. How the axial thrust by helical gears is balanced?
5. When do we employ crossed helical gear?
6. Mention the types of failure in worm gear drives.
7. What is kinematic arrangement as applied to gear boxes?
8. What are preferred numbers?
9. Sketch an internal shoe brake and name the various parts.
10. In cone clutches semi-cone angle should be greater than 12° . Why?

PART B — (5 × 16 = 80 marks)

11. (a) Design a V-belt drive to drive a machine at 40 rpm from a motor running at 1440 rpm. Assume suitable parameters.

Or

- (b) Select a wire-rope for a vertical mine hoist to lift a load of 30 kN from a depth of 600 m. A rope speed of 3 m/s is to be attained in 10 seconds.

12. (a) Design a pair of cast steel spur gears to connect two shafts and to transmit 9 kW at 900 rpm of pinion. The gear is to rotate at 450 rpm. The pitch line velocity of the gears is not to exceed 9 m/s. The gear pair is required to last for atleast 10,000 hrs. Check for bending and wear loads.

Or

- (b) Design a pair of steel helical gears to transmit 6 kW at 600 rpm of pinion. The gear ratio is 3 : 1. The centre distance is to be 240 mm. The drive has to work for 6 hours per day for 4 years.
13. (a) A pair of 20° full depth involute teeth bevel gears are to be designed to connect two shafts at right angles having velocity ratio 4 : 1. The gear is made of cast steel and the pinion is made of C 40 material. The pinion transmits 40 kW at 720 rpm. Design the gears completely. Expected gear life is 10000 hrs.

Or

- (b) Design a worm gear drive to transmit 12 kW at 1200 rpm. Speed reduction desired is 30 : 1. The worm is made of hardened steel and the wheel of phosphor bronze. Check the heating capacity of gears and determine the efficiency.
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) (i) The lead screw of a lathe has square threads of 25 mm outside diameter 5 mm pitch. To drive the tool garage the screw exerts an axial force of 2000 N. Find the efficiency of the screw and the HP required to drive the screw if it rotates at 30rpm. Neglect bearing friction and assume coefficient of friction of the screw thread as 0.12. (8)
- (ii) A multi-disc clutch employs 3 steel and 2 bronze discs having outer diameter 30 cm and inner diameter 20 cm. If the coefficient of friction is assumed as 0.22, find the axial pressure and the HP transmitted if the unit normal pressure is 1.5 kg/cm^2 and the speed is 700 rpm. (8)

Or

- (b) (i) A 8 ton screw jack having a maximum lift of 200 mm, has double square threads. Determine the size of the screw, size of cap collar and the length of the nut, if the maximum allowable compressive stress is not to exceed 300 N/mm^2 . Also determine the torque to rise the load and over all efficiency of the jack. (6)
- (ii) A 30 kg wheel 500 mm diameter turning at 200 rpm in stationary bearings is brought to rest by pressing a brake shoe radially against a rim with a force of 100 N. If the radius of gyration of the wheel is 0.3 m, how many revolution will the wheel makes before coming to rest. Assume that the coefficient of friction between shoe and the rim has the steady value of 0.5. (10)
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