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**Question Paper Code : 13056**

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2012.

Sixth Semester

Mechanical Engineering

080120034 — DESIGN OF TRANSMISSION SYSTEMS

(Regulation 2008)

Time : Three hours

Maximum : 100 marks

Use of Standard Design Data Book is permitted.

Assumptions and assumed data have to be stated clearly.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the factors on which the coefficient of friction between the belt and pulley depend?
2. What do you mean by galling of roller chains?
3. List the various types of gear tooth failure.
4. Define the various pitch in a helical gear.
5. List the various types of bevel gears.
6. What are the various losses in the worm gear drive?
7. Write short notes on the working principle of sliding mesh gear box.
8. What does the ray diagram of gear box indicates?
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) For a flat belt drive, the following data are given: Power transmitted = 9kW, Speed of motor = 1500 rpm. Speed of driven pulley = 500 rpm, Velocity of belt = 16 m/s, Density of belt material = 9.8 kN/m<sup>3</sup>, Small diameter to thickness of belt ratio = 36, Factor of safety = 8, Ultimate strength of belt material = 24 MPa, Centre distance = 2.1m, Coefficient of friction = 0.36. Design the belt.

Or

- (b) A compressor running at 250 rpm requires 80kW. The drive is by V-belts from an electric motor running at 800 rpm. The diameter of the pulley on the compressor shaft should not be greater than 1m while center distance between pulleys is limited to 1.8 m. The belt speed should not exceed 1500 m/min. Determine the number of belts required to transmit the power if each belt has a cross-sectional area of 360 mm<sup>2</sup>, density 100 kg/m<sup>3</sup> and allowable tensile stress of 2.5 N/mm<sup>2</sup>. The groove angle of pulley is 36°. The coefficient of friction between the belt and the pulley is 0.3. Also determine the length of belt.
12. (a) Design a spur gear drive to transmit 15 kW at 900rpm of forged steel pinion 120 mm diameter to a cast steel gear to run at 300 rpm. Take pressure angle of 20° and working life of the gears as 10000hrs.

Or

- (b) A pair of helical gears for a turbine has a transmission ratio of 10:1. The pinion rotates at 5000 rpm and made of carbon steel and the gear wheel is made of high grade cast iron. Power transmitted = 90 kW. The gear pair is required to last for atleast 12000 hrs. Select suitable gear materials.
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) Construct the speed diagram, and the kinematic layout for a nine speed gear box for the head stock of a turret lathe. The gear box is to provide a speed range of 100 rpm to 600 rpm. Determine the number of teeth on all gears. Also calculate the diameter of shafts in different stages of gear box.

Or

- (b) Construct the ray diagram and kinematic layout for a 18 speed gear box used in a milling machine. The drive is from an electric motor of 3.75 kW at 1440 rpm. The maximum and minimum speeds of the machine spindle are to be around 650 rpm and 35 rpm respectively.
15. (a) A square threaded power screw has a nominal diameter of 44 mm and a pitch of 7 mm with double threads. The load on the screws is 6 kN and mean diameter of the thrust washer is 50 mm. If co-efficient of friction is 0.12, determine
- (i) torque required to raise the load,
  - (ii) torque required to lower the load,
  - (iii) efficiency and
  - (iv) whether the screw is of self locking type?

Or

- (b) Design a multiplate clutch to transmit 15 kW at 1500 rpm. The clutch is fitted with steel and phosphor bronze plates arranged alternately and run in oil. The maximum torque to be transmitted is 30% greater than the mean torque. Sketch the arrangement of plates.
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