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**J 3318**

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2009.

Sixth Semester

Mechanical Engineering

ME 1352 — DESIGN OF TRANSMISSION SYSTEMS

(Common to B.E. Part Time – Fifth Semester Mechanical Engineering –  
Regulation 2005)

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Usage of Approved Design Data Book is permitted.

Assumptions and assumed data have to be stated clearly.

PSG Design Data Book may be permitted.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How is a wire rope specified?
2. Give the condition for maximum power transmission in terms of centrifugal tension in case of belt drive.
3. Mention a few gear materials.
4. State an advantage and a disadvantage of helical gear.
5. When is bevel gear preferred?
6. Calculate the angle between the shafts of a crossed helical gears made of two right handed helical gears of 15° helix angle each.
7. Where is multi-speed gear boxes employed?
8. Name the series in which speeds are arranged in multi-speed gear boxes.
9. Name four profiles normally used in cams.
10. Under what condition of a clutch, uniform rate of wear assumption is more valid?

PART B — (5 × 16 = 80 marks)

11. (a) Design a flat belt drive to transmit 25 kW at 720 rpm to an aluminium rolling machine with a speed reduction of 3.0. The distance between the shafts is 3 m. Diameter of rolling machine pulley is 1.2 m.

Or

- (b) Design a chain drive to activate a compressor from a 15 kW electric motor at 960 rpm. The compressor speed is 300 rpm. The chain tension may be adjusted by shifting the motor on rails. The compressor is to work 8 hours/day.
12. (a) In a spur gear drive for a rock crusher, the gears are made of case hardened alloy steel. The pinion is transmitting 18 kW at 1200 rpm with a gear ratio of 3.5. The gear is to work 8 hours/day for 3 years. Design the drive's major dimensions, check for compressive and bending stresses and sketch the arrangement.

Or

- (b) A pair of helical gears subjected to heavy shock loading is to transmit 37.5 kW at 1750 rpm of the pinion. The speed reduction ratio is 4 and the helix angle is  $15^\circ$ . The service is continuous and the teeth are  $20^\circ$  full depth in the normal plane. Select suitable material and design the gears. Check for working stresses and sketch the drive.
13. (a) Design a bevel gear drive to transmit 10 kW at 1440 rpm. Gear ratio is 3, material for pinion and gear is C45 steel. Minimum number of teeth is to be 20.

Or

- (b) A hardened steel worm rotates at 1440 rpm and transmits 11 kW to a phosphor bronze gear with gear ratio of 15. Design the worm gear drive and determine the power loss by heat generation.
14. (a) Design a nine speed gear box for a minimum speed of 35 rpm and a maximum speed of 560 rpm. Draw the speed diagram and kinematic arrangement showing number of teeth in all gears. Check whether all the speeds obtained through the selected gears are within  $\pm 3\%$ .

Or

- (b) Design a 12 speed gear box for an all geared headstock of a lathe by drawing speed diagram. Show the details in a kinematic lay out. The maximum and minimum speeds are to be 1400 rpm and 112 rpm respectively. Take the input drive speed to be the 1400 rpm.

15. (a) A single plate clutch is used for an engine that develops a maximum torque of 120 N-m. Assume a factor of safety of 1.5 to account for slippage at full engine torque. The permissible intensity of pressure is 350 kPa and the coefficient of friction is 0.35. Calculate the inner and outer diameters of the friction lining and the axial force to be exerted by the springs to engage the clutch.

Or

- (b) A 360 mm radius Brake drum contacts a single shoe as shown in Figure 15 (b) and resists a torque of 225 Nm at 500 rpm. The co-efficient of friction is 0.3. Determine (i) the normal reaction on the shoe, (ii) the force to be applied at the lever end for counter clockwise rotation of the drum if  $e = 0$  (iii) the force to be applied at the lever end for clockwise rotation of the drum if  $e = 40$  mm, (iv) the force to be applied at the lever end for counter clockwise rotation of the drum if  $e = 40$  mm.

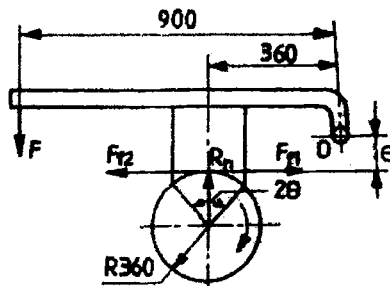


Figure 15 (b)