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Question Paper Code : 31542

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2010.

Sixth Semester

Mechanical Engineering

ME 1352 — DESIGN OF TRANSMISSION SYSTEMS

(Regulation 2004)

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

Time : Three hours

Maximum : 100 marks

Usage of approved desing data book is permitted.

Assumptions and assumed data have to be stated clearly.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State reasons for V-belt drive being preferred to flat belt drive?
2. What do you mean by galling of roller chains?
3. In a pair of spur gears, the module is 6mm. Determine the circular pitch and the diametral pitch.
4. If the radial force component of the bevel gear is 1200N (+ y direction), determine the axial component of the pinion in the gear drive. Also write down the relation between axial force and tangential force component.
5. A pair of worm gears is designated as 2 / 54 / 10 / 5. Find the gear ratio.
6. Mention the reason for irreversibility in worm gears.
7. What are the possible arrangements to achieve 16 speeds from a gear box? Which is the preferred arrangement?
8. What does the ray diagram of gear box indicates?
9. List the characteristics of material used for brake lining.
10. Define base circle and pitch circle with respect to cam.

PART B — (5 × 16 = 80 marks)

11. (a) The reduction of speed from 360 rpm to 120 rpm is desired by the use of chain drive. The driving sprocket has 10 teeth. Find the number of teeth on the driven sprocket. If the pitch radius of the driven sprocket is 250mm and the centre to centre distance between the two sprockets is 400mm, find the pitch and length of the chain.

Or

- (b) A V-belt drive consists of three V-belts in parallel on grooved pulleys of the same size. The angle of groove is 30° and the coefficient of friction 0.12. The cross sectional area of each belt is 800mm^2 and the permissible safe stress in the belt material is 3 MPa. Calculate the power that can be transmitted between two pulleys 400mm in diameter rotating at 960rpm.
12. (a) A 27.5 kW power is transmitted at 450 rpm to a shaft running at approximately 112 rpm through a spur gear drive. The load is steady and continuous. Design the gear drive and check the design. Assume the following materials: Pinion-heat treated cast steel; Gear-High grade cast iron.

Or

- (b) A pair of helical gears subjected to moderate shock loading is to transmit 20kW at 1500 rpm of the pinion. The speed reduction ratio is 4 and the helix angle is 20° . The service is continuous and the teeth are 20° full depth in the normal plane. For the gear life of 10,000 hours, design the gear drive.
13. (a) Design a cast iron bevel gear drive for a pillar drilling machine to transmit 1.5kW at 800rpm to a spindle at 400 rpm. The gear is to work for 40 hours per week for 3 years. Pressure angle is 20° . Check the design and calculate the basic dimensions.

Or

- (b) A hardened steel worm rotates at 1440 rpm and transmits 12 kW to a phosphor bronze gear. The speed of the worm wheel should be $60 \pm 3\%$ rpm. Design the worm gear drive if an efficiency of at least 82% is desired.
14. (a) A gear box is to be designed for the following specifications :
- | | |
|-------------------------|------------|
| Power to be transmitted | = 5.5 kW |
| Number of speeds | = 9 |
| Minimum speed | = 280 rpm |
| Maximum speed | = 1800 rpm |
| Input motor speed | = 1400 rpm |
- Draw the kinematic layout diagram and the speed diagram. Determine the number of teeth on all gears.

Or

- (b) The spindle of a pillar drill is to run at 12 different speeds in the range of 100rpm and 355rpm. Design a three stage gear box with a standard step ratio. The gear box receives 5kW from an electric motor running at 360rpm. Sketch the layout of the gear box, indicating the number of teeth on each gear. Also sketch the speed diagram.
15. (a) A cam is to give the following motion to a knife-edged follower :
- (i) Outstroke during 60° of cam rotation;
 - (ii) Dwell for the next 30° of cam rotation;
 - (iii) Return stroke during next 60° of cam rotation; and
 - (iv) Dwell for the remaining 210° of cam rotation. The stroke of the follower is 40mm and the minimum radius of the cam is 50mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis of the follower passes through the axis of the cam shaft.

Or

- (b) A cone clutch is to transmit 7.5kW at 900 rpm. The cone has a face angle of 12° . The width of the face is half of the mean radius and the normal pressure between the contact faces is not to exceed 0.09 N/mm^2 . Assuming uniform wear and the coefficient of friction between contact faces as 0.2, find the main dimensions of the clutch and the axial force required to engage the clutch.
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