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Question Paper Code : 30927

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2024.

Sixth Semester

Mechanical Engineering

ME 8651 — DESIGN OF TRANSMISSION SYSTEMS

(Common to Mechanical Engineering (Sandwich)/
Mechanical and Automation Engineering)

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Define the term “crowning of pulley”.
2. How are the ends of flat belt joined?
3. What are the profiles of spur gear?
4. State the law of gearing.
5. Define the following terms: (a) cone distance (b) face angle.
6. How does the helical angle of a worm gear influence the gears efficiency and load-carrying capacity?
7. Name the order in which the speeds of a multispeed gearbox are organized,
8. Draw the kinematic layout of gears with three speeds between two shafts.
9. List the properties of the material used for brake lining.
10. Identify four profiles commonly used in cam.

PART B — ($5 \times 13 = 65$ marks)

11. (a) Design a rubber belt to drive a dynamo generating 30 kW at 2250 rpm and fitted with a pulley 200 mm diameter. Assume dynamo efficiency to be 85%. Allowable stress for belt = 2.1 MPa; Density of rubber = 1000 kg/m³; Angle of contact for dynamo pulley = 165°; coefficient of friction between belt and pulley = 0.3.

Or

- (b) Design a chain drive to actuate a compressor from a 10 kW electric motor at 960 rpm is to work for 10 hours/day. The compressor speed is to be 350 rpm. Minimum centre distance should be 0.5 m. Motor is mounted on an auxiliary bed.
12. (a) A speed-reducing unit using spur gear is to be designed. Power to be transmitted is 60 HP and is continuous with moderate shock loads. The speed of the shaft are 720 rpm to 144 rpm respectively. The centre distance is kept as small as possible. Select suitable material and design the gears. Give the design details of gears.

Or

- (b) A helical gear drive is required to transmit 20 HP power with pinion speed of 1200 rpm, speed ratio 6, helix angle is 25°. Select suitable material and design the gear.
13. (a) Design a bevel gear drive to transmit 7 kW at 1600 r.p.m, for gear ratio 6, life 10,000 hrs and material for pinion and gear is C45 steel.

Or

- (b) Provide the steps involved in design procedure for worm gear and its terminology.
14. (a) Discuss and compare the working principle of constant mesh and variable speed gear box. Also mention their applications.

Or

- (b) A gearbox is designed to transmit power from a motor to a machine tool. The input shaft rotates at 1440 rpm and the output shaft is required to rotate at 180 rpm. The gearbox is to be designed using spur gears with a standard step ratio of 4.

15. (a) A plate clutch having a single driving plate with contact surfaces on each side is required to transmit 110 kW at 1250 rpm. The outer diameter of the contact surfaces is to be 300 mm. The coefficient of friction is 0.4.
- Assuming a uniform pressure of 0.17 N/mm^2 determine the inner diameter of the friction surfaces. (8)
 - Assuming the same dimensions and the same total axial thrust, determine the maximum torque that can be when uniform wear conditions have been reached. (5)

Or

- (b) The brake system, as shown in Fig. 15(b) provides a braking torque of 360 N-m. The diameter of the brake drum is 300 mm. The coefficient of friction is 0.3. Find
- The force (P) to be applied at the end of the lever for the clockwise and counterclockwise rotation of the brake drum; and (7)
 - The location of the pivot or fulcrum to make the brake self-locking for the clockwise rotation of the brake drum. (6)

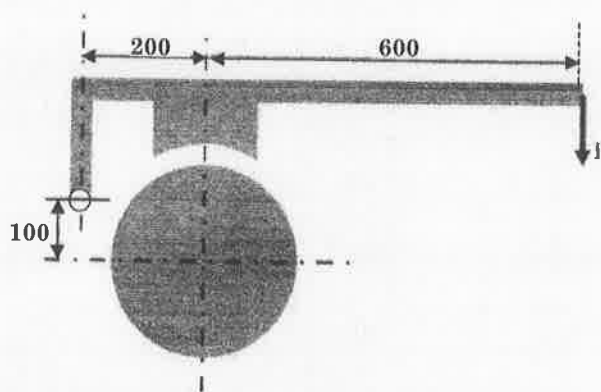


Fig. 15 (b)

PART C — ($1 \times 15 = 15$ marks)

16. (a) A headstock gearbox for turret lathe is to be designed with a 9-speed gearbox to provide a speed range of 180 rpm, and 2800 rpm. Using standard speed ratio draw the speed diagram on the kinematic layout. Also find and fix the number of teeth on all gears.

Or

- (b) A bevel gear pair is to be manufactured to transmit 20 kilowatt from pinion rotating at 400 rpm, to a gear mounted on a shaft which intersects the pinion shaft at an angle of 70° . Assume that the pinion is to have an outside pitch diameter of 200 mm and pressure angle of 20° a face width of 40 mm and the gear shaft is to rotate at 120 rpm. Determine the pitch angle for the gears and the forces on the gears.