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Question Paper Code : 40926

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2025.

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

(Permitted Design data book is allowed for examinations.)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Differentiate between flat belts and V belts.
2. Write the function of a sprocket in chain drives.
3. Mention two commonly used gear materials.
4. Define pressure angle in gears.
5. State the purpose of bevel gears.
6. What is meant by helix angle in cross-helical gears?
7. What is the function of a ray diagram in gear box design?
8. What is a fluid coupling?
9. Define cam and follower.
10. Differentiate between plate clutch and cone clutch.

PART B — ($5 \times 13 = 65$ marks)

11. (a) Two pulleys, one 450 mm diameter and the other 200 mm diameter, on parallel shafts 1.95 m apart are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. What power can be transmitted by the belt when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1 kN, and the coefficient of friction between the belt and pulley is 0.25? (13)

Or

- (b) Discuss in detail the design and selection of wire ropes, transmission chains, and sprockets, highlighting applications in mechanical power transmission. (13)
12. (a) The following particulars of a single reduction Spur gear are given:
Gear ratio = 10:1; Distance between centres = 660 mm approximately;
Pinion transmits 500 kW at 1800 r.p.m.; Involute teeth of standard proportions (addendum = m) with pressure angle of 22.5° ; Permissible normal pressure between teeth = 175 N per mm of width. Find:
- (i) The nearest standard module if no interference is to occur; (3)
 - (ii) The number of teeth on each wheel; (3)
 - (iii) The necessary width of the pinion; and (3)
 - (iv) The load on the bearings of the wheels due to the power transmitted. (4)

Or

- (b) A bronze spur pinion rotating at 600 r.p.m. drives a cast-iron spur gear at a transmission ratio of 4:1. The allowable static stresses for the bronze pinion and cast-iron gear are 84 MPa and 105 MPa, respectively. The pinion has 16 standard 20° full-depth involute teeth of module 8 mm. The face width of both gears is 90 mm. Find the power that can be transmitted from the standpoint of strength. (13)
13. (a) A triple-threaded worm has teeth of 6mm module and a pitch circle diameter of 50 mm. If the worm gear has 30 teeth of 14.5° and the coefficient of friction of the worm gearing is 0.05. Find:
- (i) The lead angle of the worm, (3)
 - (ii) Velocity ratio, (3)
 - (iii) Centre distance, and (3)
 - (iv) Efficiency of the worm gearing. (4)

Or

- (b) Design a bevel gear drive to transmit 3.5 kW, speed ratio = 4, driving shaft speed = 200 rpm. the pinion is of steel, and the wheel is of CI. Assume a life of 25000 hours. (13)

14. (a) Design a six-speed gearbox for the following data: Motor power = 5 kW at 1440 rpm maximum output speed = 1600 rpm, minimum output speed = 460 rpm. (13)

Or

- (b) Design a gearbox to give 18 speeds for the spindle of a milling machine. The drive is from an electric motor of 4 kW at 1000 rpm. The maximum and minimum speeds of the spindle are to be around 650 rpm and 35 rpm respectively. (13)

15. (a) A multi-disk clutch consists of five steel plates and four bronze plates. The inner and outer diameters of the friction disks are 75 mm and 150 mm, respectively. The coefficient of friction is 0.1, and the intensity of pressure is limited to 0.3 N/mm². Assuming the uniform wear theory, calculate

- (i) the required operating force, and (6)
 (ii) the power transmitting capacity at 750 rpm. (7)

Or

- (b) A single block brake, as shown in Figure 1, has a drum diameter of 250 mm. The angle of contact is 90° and the coefficient of friction between the drum and the lining is 0.35. If the torque transmitted by the brakes is 80 N-m, find the force required to operate the brake. (13)

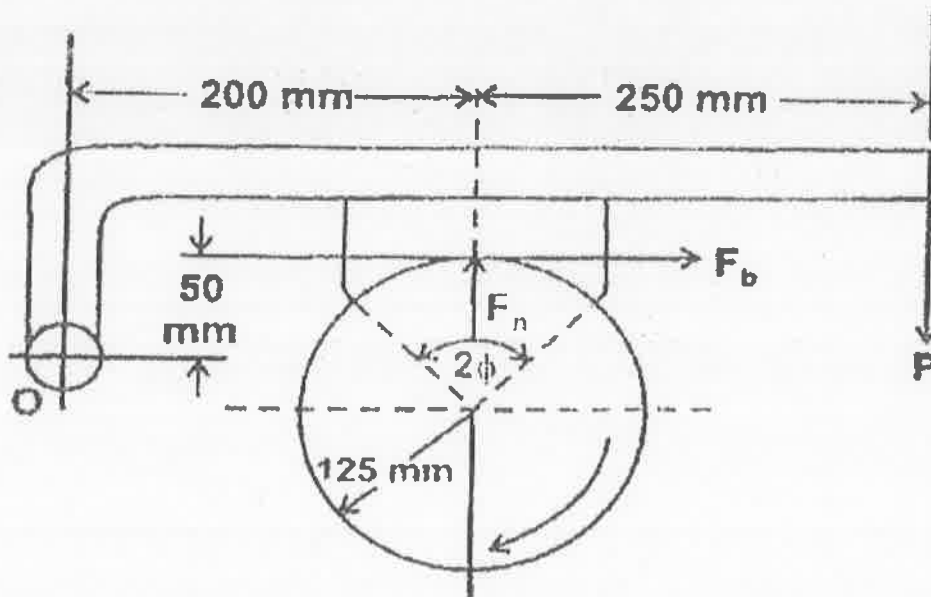


Fig. 1

PART C — (1 × 15 = 15 marks)

16. (a) Design a belt drive to transmit 110 kW for a system consisting of two pulleys of diameters 0.9 m and 1.2 m centre distance of 3.6 m, a belt speed of 20 m / s, coefficient of friction 0.3, a slip of 1.2% at each pulley and 5% friction loss at each shaft, 20% overload. (15)

Or

- (b) A belt drive consists of two V-belts in parallel, on grooved pulleys of the same size. The angle of the groove is 30° . The cross-sectional area of each belt is 750 mm^2 and $\mu = 0.12$. The density of the belt material is 1.2 Mg/m^3 , and the maximum safe stress in the material is 7 MPa. Calculate the power that can be transmitted between pulleys of 300mm diameter rotating at 1500 r.p.m. Also, the shaft speed r.p.m. at which the power transmitted would be a maximum. (15)

