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**Question Paper Code : 60924**

**B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2026**

**Sixth Semester**

**Mechanical Engineering**

**ME8651 – DESIGN OF TRANSMISSION SYSTEMS**

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

**(Regulations 2017)**

**Time : Three hours**

**Maximum : 100 marks**

**(PSG Design Data Book can be permitted)**

**Assume data wherever if necessary**

**Answer ALL questions.**

**PART A — (10 × 2 = 20 marks)**

1. State any three advantages of V-belt drives over chain drive.
2. Draw 6 × 7, 6 × 9 wire rope.
3. Write any three Gear materials.
4. List the important modes of failures in the gears and also state the causes of the gear failures.
5. Compare the performance of straight and spiral bevel gears.
6. Write the uses of worm gears.
7. Write the uses of Ray diagram and kinematic layout.
8. List out the design principles to be followed to obtain an optimum design a gear box.
9. In cam profiles, why roller type follower is highly preferred than the other counterparts. Provide sufficient reasons.
10. Differentiate between self-locking and self-energizing brakes.

PART B — (5 × 13 = 65 marks)

11. (a) Find the size and number of V-belt drive needed for the following application. Power to be transmitted is 25 kW. The speed ratio required is 4. The smaller pulley diameter is 360 mm and its rotational speed is 1400 rpm. The distance between the shafts is 1.5 metres. Assume the drive has to work for 10 hours per day

Or

- (b) A 7.5 KW electric motor running at 1400 rpm is used to drive input shaft of a gearbox used in a special purpose machine tool. Design a suitable roller chain to connect the motor shaft with gear box shaft with a speed ratio of 10:1 Assume the minimum centre distance between the drive and driven shafts as 600 mm.
12. (a) Design a spur gear drive. Transmitted power is 10 kW. Pinion speed is 850 rpm. Speed ratio is 3. The gears are to be made of C 45 steel. Life is to be 10,000 hours.

Or

- (b) A pair of helical gears subjected to moderate shock loading is to transmit 30 kW at 1500 rpm. The speed reduction ratio is 4 and the helix angle is  $20^\circ$ . The service is continuous and the teeth are  $20^\circ$  FD in the normal plane. For the gear life of 10,000 hours, design the gear drive.
13. (a) A steel worm running at 240 rpm receives 1.5 kW from its shaft. The speed reduction is 10:1. Design the drive so as to have an efficiency of 80 percentage. Also determine the cooling area required, if the temperature rise is restricted to  $45^\circ$ . Take overall heat transfer coefficient as  $10 \text{ W/m}^2 \text{ }^\circ\text{C}$

Or

- (b) Design a worm gear drive with a standard centre distance to transmit 7.5 kW from a worm rotating at 1440 rpm to a worm wheel at 20 rpm
14. (a) Draw the kinematic layout, ray diagram and calculate the number of teeth on each gear for the following data, Power = 8 kW at 1440 rpm, Number of speeds = 9; Minimum speed = 460 rpm and Maximum speed = 1440 rpm.

Or

- (b) Design the layout of a 12-speed gear box for the lathe. The maximum and minimum speeds are 1200 rpm and 100 rpm. The gear box has to transmit 5 kW with an input speed of 1440 rpm through an induction motor. Construct a speed diagram using standard speed ratios. Calculate the number of teeth in each gear wheel.

15. (a) With a neat sketch, illustrate the multiple plate clutch and explain how the number of plates is estimated.

Or

- (b) (i) Explain the working principle of an Internal expanding shoe brake with a neat sketch. (8)  
(ii) Briefly explain about heat generation and heat dissipation in brakes. (5)

PART C — ( $1 \times 15 = 15$  marks)

16. (a) Design a right-angle bevel gear drive with speed of pinion shaft ranging upto 300 rpm and that of the gear shaft is 150 rpm. The pinion with 20 number of teeth is manufactured with involute profile with pressure angle of  $20^\circ$  and module of 20 mm. Both the pinion and gear are made up of forged steel with gear having an allowable stress of  $1500 \text{ kg/cm}^2$ . Power transmitted by the gear shaft is 56 kW. Assume service factor as 2

Or

- (b) A single block brake has a drum diameter of 720 mm. If the brake sustains 225 N-m torque at 500 rpm. Determine.  
(i) The required force (P) to apply the brake for clockwise rotation of the drum.  
(ii) The required force (P) to apply the brake for counter clockwise rotation of the drum.  
(iii) The location of the fulcrum to make the brake self-locking for clockwise rotation of the drum.

Consider the coefficient of friction value as 0.3

