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**Question Paper Code : X10706**

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL / MAY 2021

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

(10×2=20 Marks)

1. What is crowning of pulley ?
2. What is a silent chain ? In what situations, silent chains are preferred ?
3. Why is a gear tooth subjected to dynamic loading ?
4. Differentiate double helical and herringbone gears.
5. What are the forces acting on a bevel gear ?
6. Why phosphor bronze is widely used for worm gears ?
7. What are preferred numbers ?
8. Define progression ratio.
9. List out commonly used friction materials.
10. What do you mean by self-locking brake ?



11. a) The leather belt 125 mm wide and 6 mm thick, transmit power from a pulley with the angle of lap  $150^\circ$  and  $\mu = 0.3$ . If the mass of  $1 \text{ m}^3$  of leather is 1 Mg and the stress in the belt is not to exceed 2.75 MPa, find the maximum power that can be transmitted and the corresponding speed of the belt.

(OR)

- b) Design a V-belt drive to the following specifications :

Power to be transmitted = 7.5 kW

Speed of driving wheel = 1440 rpm

Speed of driven wheel = 400 rpm

Diameter of driving wheel = 300 mm

Centre distance = 1000 mm

Service = 16 hours/day.

12. a) Design a spur gear drive to transmit 22.5 kW at 900 rpm. Speed reduction is 2.5. Materials for pinion and wheel are C 15 steel and cast iron grade 30 respectively. Take pressure angle of  $20^\circ$  and working life of the gears as 10000 hrs.

(OR)

- b) The torque of 250 N-m acts upon the shaft of a helical gear whose pitch circle diameter is 300 mm. The gear has 60 teeth and runs at 250 rpm. The pressure angle of teeth in transverse plane is  $18^\circ$  angle of helix is  $28^\circ$ . Calculate (i) Power transmitted (ii) driving force (iii) Normal force on gear tooth (iv) force transmitted to shaft.

13. a) Design a pair of bevel gears to transmit 10 kW at a pinion speed of 1440 rpm. Required transmission ratio is 4. Material for gears is 15Ni 2 Cr 1 Mo 15/steel. The tooth profiles of the gears are of  $20^\circ$  composite form.

(OR)

- b) The 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) The nine speed gear box, used as a head stock gear box of a turret lathe is to provide a speed range of 180 rpm to 1800 rpm. Using standard step ratio, draw the speed diagram, and the kinematic layout. Also find and fix the number of teeth on all gears.

(OR)

- b) A gear box is to be designed to provide 12 output speeds ranging from 160 rpm to 2000 rpm. The input speed of motor is 1600 rpm. Choosing a standard speed ratio, construct the speed diagram and the kinematic arrangement.
15. a) A multiple clutch has three discs on the driving shaft and two on the driving shaft. The outside diameter of the contact surfaces is 240 mm and inside diameter is 120 mm. Assume uniform wear coefficient of friction as 0.3, find the maximum axial intensity of pressure between the discs for transmitting 25 kW at 1575 rpm.

(OR)

- b) A simple band brake is operated by a lever of length 500 mm long. The brake drum has a diameter of 500 mm and the brake band embraces  $\frac{5}{8}$  of the circumference. One end of the band is attached to the fulcrum of the lever while the other is attached to a pin on the lever 100 mm from the fulcrum. If the effort applied to the end of the lever is 2000 N and the coefficient of friction is 0.25, then design the simple band brake.

PART – C

**(1×15=15 Marks)**

16. a) A  $6 \times 19$  steel wire rope is used for the elevator in the building. The weight is being lifted with a maximum speed 200 m/min. The weight of the elevator cage is 12 kN and weight of passengers is 8 kN. The lifting sheaves are of the traction type. Design a suitable wire rope sheave. Take factor of safety as 10.

(OR)

- b) A 14 speed gear box is required to furnish output speeds in the range of 125 rpm to 2500 rpm. Draw the speed diagram and kinematic arrangement.
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