A **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code: U6701

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2024

Sixth Semester

Mechanical Engineering

21UME601 - DESIGN OF TRANSMISSION SYSTEMS

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. …….. are used with electric nylon to drive different equipment's like blowers, compressor, machine tools, industries machinery and etc., CO1- U

   (a) Flat belt (b) V-belt (c) Wire rope (d) Chain drive

2. …….. is a movable bearing to regulate the chain slag and maintain required tension in the drive. CO1- U

   (a) Slack adjuster (b) Chain Housing (c) Sprockets (d) None of these

3. When the axes of two shafts are parallel, use CO1- U

   (a) crossed helical gear (b) bevel (c) worm gears (d) spur or helical gears

4. Which of the following gears have zero axial thrust? CO1- U

   (a) Herringbone gears (b) bevel gears (c) worm gears (d) helical gears

5. In a concrete mixer, the bevel gears for rotating the drum are generally CO1- U

   (a) Casting (b) forging (c) hobbing (d) shaping

6. Worm gears are widely used when CO1- U

   (a) velocity ratio is high (b) space is limited

   (c) axes of shafts are non-intersecting (d) all the three

7. When the spindle speeds are arranged in GP, then the ratio between the two adjacent speeds is known as CO1- U

   (a) Harmonic progression (b) logarithmic progression

   (c) Arithmetic progression (d) step ratio

8. In the two stage gear box how may shaft will be there CO1- U

(a) 3 (b)2 (c)1 (d) 4

9. The brake used in railway coaches is CO1- U

(a) shoe brake (b) block brake (c) band brake (d) disk brake

10 The cam follower extensively used in air-craft engines is CO1- U

(a) Knife edge follower (b) Flat faced follower

(c) Spherical faced follower (d) Roller follower

PART – B (5 x 2= 10 Marks)

11 What are the materials used in belt? CO1- U

12 Mention the interference in Involute profile CO1- U

13 State the advantages of Herringbone gear. CO1- U

14 List out the conditions of Speed diagram. CO1- U

15 In cone clutches semi– cone angle should be greater than 12.5degree. Why? CO1- U

PART – C (5 x 16= 80 Marks)

16 (a) Design a fabric belt to transmit 10 kw at 450 rpm from an engine to a line shaft as 1200 rpm. The diameter of the engine pulley is 600 mm and the distance of the shaft from the engine is 2 m. CO2- App (16)

Or

(b) A 600 rpm blower is to be driven by a 10 kW, 1440 rpm motor approximately 750 mm away. Design a suitable chain drive. CO2- App (16)

17 (a) Design a Spur gear drive required to transmit 45 kW at a pinion speed of 800 rpm. The velocity ratio 3.5 : 1. The teeth are 20^0 full depth involute with 18 teeth on the pinion. Both the pinion and gear are made of steel with a maximum safe static stress of 180 N/mm^2. Assume medium shock condition. CO3- App (16)

Or

(b) Design helical gear to transmit 7.5 kW at 1400 rpm; to the following specification: CO3- App (16)

Speed reduction = 3

Pressure Angle = 20^0

Helix angle = 10^0

Design Compressive stress = 9020 Kg/cm^2

Design Bending Stress = 2100 Kg/cm^2

Modulus of elasticity of materials = 2.05 x 10^6 $kg/cm^{2.}$

18 (a) Design a Bevel gear drive to transmit 10 kW at 1400rpm. Gear ratio is 3; pinion and gear are made of C45 steel; Life of gear 10,000hrs. CO3- App (16)

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 ± 3% rpm. Design the worm gear drive if an efficiency of atleast 82% is desired. CO3- App (16)

19 (a) Design and analyze a Nine speed gearbox for a milling machine with Speeds rangingfrom56–900rpm.The output speed is 720rpm; Make a neat sketch of the gear box. Indicate the number of teeth on all the gears and their speeds. CO5- Ana (16)

Or

(b) Design and analyze a gearbox is to be designed to provide 12 output speeds ranging from 160 to 2000rpm. The input speed of the motor is 1600rpm.Choosing a standard speed ratio, construct the speed diagram and the kinematic arrangement. CO5- Ana (16)

20 (a) A single plate clutch with both sides of the plates being effective, is used to transmit power at 1440 rpm. It has inner and outer radii 80mm and 60mm respectively. The maximum intensity of pressure is limited the 10x 10^4 N/m^2.If coefficient of friction is 0.25. (i) total pressure exerted on the plate (ii) Power transmitted. CO5- Ana (16)

Or

(b) The diameter of the brake drum of a single block is 1m shown in fig. It sustains 240 N-m of torque at 400rpm. The coefficient of friction is 0.32. Determine the required force to be applied when the rotation of the drum is a) clockwise, b) counter clockwise, and the angle of contact (i) 35deg and (ii) 100deg.
Given that a = 800mm, b =150mm and c =25mm. Also find the new values of 'c' for self-locking of the brake. CO5- Ana (16)