Reg. No. : | | | | | | | | | | | | |

Question Paper Code: U6701

B.E. / B.Tech. DEGREE EXAMINATION, NOV 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. The materials used for Wire ropes is/ are…….. CO1- U

   (a) Wrought iron (b) Cast steel (c) Alloy Steel (d) All the above

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. Which of the following type of drives transmit power by friction? CO1- U

   (a) spur gear drive (b) chain drive (c)worm gear drive (d) belt drive

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. The number of starts on worm for a velocity ratio of 40 is CO1- U

   (a) Single (b) double (c) triple (d) quadruple

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. The structural formula for a 9 speed gear box is CO1- U

(a) 3(3)*3(1) (b)3(1)* 3(3) (c) 3(3)* 3(3) (d) 3(1)* 3(1)

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 Explain the stresses induced in a wire rope? CO1- U

12 Mention the interference in Involute profile CO1- U

13 List out the design procedure for bevel gear CO1- U

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

15 Clutches are usually designed on the basic of uniform wear. Why? CO1- U

PART – C (5 x 16= 80 Marks)

16 (a) Design a suitable a chain drive to operate a compressor from a 15 kW electric motor at 900 rpm; The compressor is to be run at a speed of 300 rpm; The minimum center distance should be 550mm. CO2- App (16)

Or

(b) 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)

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) Compute the various worm gear terminology. The worm gear drive to transmit 22.5 kW from a worm at 1440 rpm. The speed reduction ratio is 24:1. Design the drive so as to have an efficiency of 85%. CO3- App (16)

Or

(b) Design a cast iron bevel gear drive for a pillar drilling machine to transmit 1875 W at 800 rpm to a spindle at 400 rpm. The gear is to work for 40 hours per week for 3 years. Pressure angle is 20^0 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 multi plate disc clutch transmits 55kW of power at 1800rpm coefficient of friction for the friction surfaces is 0.1.Axial intensity at pressure is not to exceed 160kN/m^2.The internal radius is 80mm and is 0.7 times the external radius. Find the number of plates needed to transmit the required torque. 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. CO5- Ana (16)

Given that a = 800mm, b =150mm and c =25mm. Also find the new values of 'c' for self-locking of the brake.