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## Question Paper Code: 56701

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2019
Sixth Semester
Mechanical Engineering

15UME601-DESIGN OF TRANSMISSION SYSTEMS

(Regulation 2015)

(Design data book permitted)

Duration: Three hours                                    Maximum: 100 Marks

Answer ALL Questions

PART – A   (10 x 1 = 10 Marks)

1.  The width of the pulley should be                                    CO1-R

    (a) Equal to the width of belt          (b) Less than the width of the belt

    (c) Greater than the width of the belt  (d) None of the above

2.  The wire rope make contact at                                    CO1-R

    (a) Bottom of the grooved pulley        (b) Side of the grooved pulley

    (c) Side and bottom of the grooved pulley  (d) Anywhere in the grooved pulley

3.  The size of gear is usually specified by                          CO2-R

    (a) Pressure angle                      (b) Pitch circle diameter

    (c) Circular pitch                      (d) diametrical pitch

4.  The helix angle for double helical gears may be up to            CO2-R

    (a) 45°          (b) 60°          (c) 75°          (d) 90°

5.  When bevel gears having equal teeth and equal pitch angles connect two    CO3-R
    shafts whose axes intersect at right angles the they are known as

    (a) Angular bevel gear                  (b) Crown bevel gear

    (c) Internal bevel gear                 (d) Mitre gear

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6. In worm gears the angle between the tangent to the thread helix on the pitch cylinder and the plane normal to the axis of worm is called     CO3-R

(a) Pressure angle                 (b) Lead angle

(c) Helix angle                   (d) Friction angle

7. The possible arrangement of 12 speed gear box is     CO4-R

(a) $2 \times 2 \times 3$     (b) $6 \times 2$     (c) $2 \times 6$     (d) $3 \times 3$

8. Name the series in which speeds of multispeed gear box are arranged     CO4-R

(a) Arithmetic progression         (b) Geometric progression

(c) Logarithmic progression       (d) Harmonic progression

9. In case of multiple disc clutch if $n_1$ are the number of discs on the driving shaft and $n_2$ are the number of discs on the driven shaft, then the number of pairs of contacting surfaces will be     CO5-R

(a) $n_1 + n_2$     (b) $n_1 + n_2 - 1$     (c) $n_1 + n_2 + 1$     (d) None of these

10. A brake commonly used in motor cars is     CO5-R

(a) Shoe brake               (b) Band brake

(c) Band and block brake        (d) Internal expanding brake

### PART – B (5 x 2 = 10 Marks)

11. State the law of belting     CO1-U

12. What is the virtual number of teeth in helical gears     CO2-U

13. Why the efficiency of a worm gear drive comparatively low     CO3-U

14. State any three basic rules to be followed while designing a gear box     CO4-U

15. What are the functions of clutch     CO5-U

### PART – C (5 x 16 = 80 Marks)

16. (a) Select a V belt drive for transmitting 15kW from a motor running at 1450rpm to a blower at 300rpm in an air conditioning plant. The center distance should be at least 1.5times the diameter of the larger pulley. Diameter of motor pulley is 300 mm.     CO1-App     (16)

Or

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(b) The transporter of a heat treatment furnace is driven by a 4.5 kW, 1440 rpm induction motor through a chain drive with a speed reduction ratio of 2.4. The transmission is horizontal with bath type of lubrication. Rating is continuous with 3 shifts per day. Design the complete chain drive.    CO1-App    (16)

17. (a) In a spur gear for a rock crusher, the gears are made of case hardened steel. The pinion is transmitting 18KW at 1200rpm, with a gear ratio of 3.5. The gear is to work 8hrs/day for 3 years. Design the drive.    CO2-App    (16)

Or

(b) A pair of helical gears with 23° helix angle is to transmit 2.5 KW at 1000rpm of the pinion. The velocity ratio is 4:1. The pinion is to be forged steel and the driven gear is to be cast steel. The gears are of 20° full depth involutes form and the pinion is to have 24 teeth. Design the gear drive.    CO2-App    (16)

18. (a) Design a bevel gear drive to transmit 10KW at 1440rpm. Gear ratio is 3, material for pinion and gear is C45 steel and CI grade 35. Minimum number of teeth is to be 22.    CO3-C    (16)

Or

(b) Design a worm gear drive to transmit a power of 22KW. The worm speed is 1440rpm and the speed ratio of 24. The drive should have a minimum efficiency of 85% and above. Select suitable material for the worm and wheel and decide upon the dimensions of the drive.    CO4-C    (16)

19. (a) A six speed gear box is required to provide speeds in the range of 125rpm and 400rpm with a step ratio of 1.25 and transmit a power of 5KW at 710rpm. Design the gear box.    CO4-C    (16)

Or

(b) A 12 speed gear box is to provide a minimum speed of 31.5rpm with a step ratio of 1.12. Using standard step ratios, find the number of teeth on all gears.    CO4-C    (16)

20. (a) A leather faced conical clutch has a cone angle of 30°. If the intensity of pressure between the contact surfaces is limited to $0.35 \text{N/mm}^2$ and the breath of the conical surface is not to exceed one - third of the mean radius, find the dimensions of the contact surfaces to transmit 22.5KW at 2000rpm. Assume uniform rate of wear and take coefficient of friction as 0.15.    CO5-App    (16)

Or

(b) A single plate clutch transmits 25 kw at 900 rpm maximum pressure intensity between the plates is $85 \text{kN/M}^2$ . The ratio of radius is 1.25. Both the sides of the plate are effective and the coefficient of friction is 0.25.    CO5-App    (16)

Determine

(i) The inner diameter of the plate

(ii) The axial force to engage the clutch.

Assume theory of uniform wear.