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| Question Paper Code | 11831 |

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2023
Sixth Semester
Mechanical Engineering
ME8651 - DESIGN OF TRANSMISSION SYSTEMS
(Regulations 2017)

Duration: 3 Hours   Max. Marks: 100

PART-A (10 × 2 = 20 Marks)
Answer ALL Questions

		Marks, K-Level, CO
1.	What is chordal action in chain drives?	2,K1,CO1
2.	State the law of belting.	2,K1,CO1
3.	Define module.	2,K1,CO2
4.	In a pair of spur gear, the module is 6mm. Determine the circular pitch and diametral pitch.	2,K2,CO2
5.	What are various losses in worm gear?	2,K1,CO3
6.	List out the forces acting on bevel gear.	2,K1,CO3
7.	What are preferred numbers?	2,K1,CO4
8.	Write the significance of structural formula.	2,K1,CO4
9.	Why are cone clutches better than disc clutches?	2,K2,CO5
10.	What are effects of temperature rise in clutches?	2,K1,CO5

PART - B (5 × 13 = 65 Marks)
Answer ALL Questions

11. a) A V-belt drive is to transmit 50KW in a heavy duty saw mill which works in two shifts of 8 hours each. The speed of the motor shaft is 1440 rpm with the approximate speed reduction of 2 in the machine shaft. The peripheral speed of the belt should not exceed 24m/s. Design the drive and calculate the average stress induced in the belt.   `13,K2,CO1`

OR

   b) The reduction of speed from 360 rpm to 120 rpm is desired by the use of chain drive. The driving sprocket has 10 teeth. Find the number of teeth on the driven sprocket. If the radius of driven sprocket is 250mm and the center to center distance between the two sprockets is 400mm, find the pitch and length of the chain.   `13,K2,CO1`

12. a) Design a spur gear drive required to transmit 45KW at a pinion speed of 800 rpm. The velocity ratio is 3.5:1. The teeth are 20° involute with   `13,K3,CO2`

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **11831**

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 conditions.

OR

b) A pair of helical gear subjected to moderate shock loading is to transmit 20KW at 1500 rpm of the pinion. The speed reduction ratio is 4 and the helix angle is 20°. The service is continuous and the teeth are 20° full depth in the normal plane. For the gear life of 10,000 hours, design the gear drive.

13,K3,CO2

13. a) Design the teeth of a pair of bevel gears to transmit 18.75 kW at 600 rpm of the pinion. The velocity ratio should be about 3 and the pinion should have about 20 teeth which are full depth 20° involutes. Find the module, face width, diameter of the gears and pitch core angle for both gears.

13,K3,CO3

OR

b) Design a worm gear drive to transmit 22.5 kW at a worm speed of 1440 rpm. Velocity ratio is 24:1. An efficiency of at least 85% is desired. The temperature rise should be restricted to 40° C. Determine the required cooling area.

13,K3,CO3

14. a) Design the layout of a 12 speed gear box for a milling machine having an output of speeds ranging from 180 to 2000 rpm. Power is applied to the gearbox from a 6 kW induction motor at 1440 rpm. Choose the standard step ratio and construct the speed diagram. Decide upon the various reduction ratios and number of teeth on each gear wheel sketch the arrangement of the gear box.

13,K3,CO4

OR

b) Design a 9 speed gear box for the following data. Minimum speed: 100rpm, step ratio: 1.25. The input is from a 4KW, 1440rpm motor. Draw the speed diagram, kinematic diagram and indicate the number of teeth on each gear.

13,K3,CO4

15. a) A single plate clutch, effective on both sides, is required to transmit 25 KW at 3000 rpm. Determine the outer and inner diameter of frictional surfaces if the coefficient of friction is 0.25, ratio of diameter is 1.25 and the maximum pressure is not to exceed 0.1 N/mm^2. Determine: (i) the face width required and (ii) the axial spring force necessary to engage the clutch.

13,K3,CO5

OR

b) A Plate Clutch effective on one side, with maximum diameter 600mm has maximum lining pressure of 0.35 MPa. The power to be transmitted at 400 rpm is 135 KW and μ= 0.3. Find inside diameter and spring force required to engage the clutch. Springs with spring index 6 and material spring steel with safe shear stress 600 MPa are used. Find the diameters if 6 spring are used.
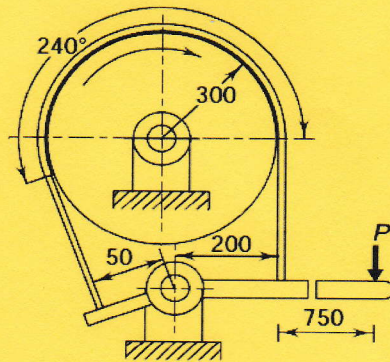
13,K3,CO5

PART - C (1 × 15 = 15 Marks)

16. a) A single block brake, the diameter of the drum is 250mm and the angle of contact is 90°. The operating force of 700N is applied at the end of the lever which is at b = 250mm from the center of the brake block. Determine the torque that may be transmitted. Fulcrum is at a = 200mm from the center of the brake block with an offset of c = 50mm from the surface of contact. The coefficient of friction is 0.35. *15,K3,CO6*

OR

b) A Differential Band Brake is shown in Figure 1. The width and the thickness of the steel band are 100 mm and 3 mm respectively and the maximum tensile stress in the band is 50 N/mm2. The coefficient of friction between the friction lining and the brake drum is 0.25. Calculate: (i) the tensions in the band; (ii) the actuating force; (iii) the torque capacity of the brake; *15,K3,CO6*

Figure 1