Reg. No.															

Question Paper Code	13164

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Sixth Semester

Mechanical Engineering

20MEPC601 - DESIGN OF TRANSMISSION SYSTEMS

Regulations - 2020

(Use of Approved Design Data book is permitted and any required design data can be suitably assumed)

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	*K – Level*	*CO*
1.	_____are used to transmit power between two shafts by means of friction. (a) Belt Drives (b) Gear Drives (c) Chain Drives (d) Rope drives	*1*	*K1*	*CO1*
2.	Selection of Flat Belt Drive depends on (a) Power to be Transmitted (b) Speed of Driver and Driven Shafts (c) Positive drive requirement (d) All of the mentioned	*1*	*K1*	*CO1*
3.	Number of ropes will be equal to (a) Recommended factor of safety + Working factor of safety (b) Recommended factor of safety - Working factor of safety (c) Recommended factor of safety × Working factor of safety (d) Recommended factor of safety / Working factor of safety	*1*	*K1*	*CO1*
4.	The form factor of a spur gear tooth depends upon _____ (a) circular pitch only (b) pressure angle only (c) number of teeth and circular pitch (d) number of teeth and the system of teeth	*1*	*K1*	*CO2*
5.	Mitre gears are used for (a) great speed reduction (b) equal speed (c) minimum axial thrust (d) minimum backlash	*1*	*K1*	*CO2*
6.	The normal pressure angle in helical gears is related to _____. (a) Tooth thickness (b) Helix angle (c) Pressure angle (d) Helix angle	*1*	*K1*	*CO2*
7.	Which of the following type of gear tooth failure is caused due to incorrect alignment of gears? (a) Scoring (b) Pitting (c) Corrosive wear (d) Abrasive wear	*1*	*K1*	*CO3*
8.	Which of the following is not true for worm gears? (a) High speed ratio with a single worm drive pair is possible (b) Smooth and silent operation (c) Self-locking operation provision is possible (d) Worm drives have high efficiency	*1*	*K1*	*CO3*
9.	The back cone is an imaginary cone the elements of which are perpendicular to the elements of the pitch cone at _____. (a) any end of the tooth (b) the pitch line of the tooth (c) the smaller end of the tooth (d) the larger end of the tooth	*1*	*K1*	*CO3*
10.	If the number of stages in a gearbox is 'n', how many vertical lines will be drawn at a convenient distance in a structure diagram? (a) n+1 (b) n-1 (c) n (d) n/2	*1*	*K1*	*CO4*
11.	A ray diagram is used in gear box design to represent _____. (a) Speed ratios (b) Gear teeth profile (c) Gear dimensions (d) Kinematic layout	*1*	*K1*	*CO4*
12.	Variable speed gear boxes are used to _____. (a) Decrease output torque (b) Maintain constant speed (d) change torque range (d) Adapt to load changes	*1*	*K1*	*CO4*

13.	Which of the following is a characteristic of a cone clutch? (a) Self-engagement (b) High torque capacity (c) Smooth engagement (d) High engagement reliability	*1*	*K1*	*CO5*
14.	The following is known as a positive clutch (a) single plate clutch (b) cone clutch (c) jaw clutch (d) centrifugal clutch	*1*	*K1*	*CO5*
15.	For a safe design, a friction clutch is designed assuming _____. (a) uniform pressure theory (b) uniform wear theory (c) varying pressure theory (d) varying wear theory	*1*	*K1*	*CO5*
16.	The following is not a friction clutch (a) fluid clutch (b) centrifugal clutch (c) cone clutch (d) disc clutch	*1*	*K1*	*CO5*
17.	An internal expanding shoe brake is mainly used in (a) vehicle (b) conveyor (c) hoist (d) all of the above	*1*	*K1*	*CO6*
18.	Which type of brake is commonly employed in railway trains? (a) Block brake (b) Internal expanding brake (c) Band brake (d) Any of the above	*1*	*K1*	*CO6*
19.	In a self-locking brake, the force required to apply the brake is _____. (a) Minimum (b) Zero (c) Maximum (d) non-zero	*1*	*K1*	*CO6*
20.	When a body slides over another, the frictional force experienced by the body is known as _____ friction. (a) Sliding (b) Rolling (c) Static (d) Dynamic	*1*	*K1*	*CO6*

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21.	How will you designate V-belt?	*2*	*K2*	*CO1*
22.	What is chordal action in chain drives?	*2*	*K1*	*CO1*
23.	Differentiate Herringbone gear and double helical gear.	*2*	*K2*	*CO2*
24.	Why is the pinion weaker than the gear made of same material?	*2*	*K2*	*CO2*
25.	When do we use bevel gear?	*2*	*K1*	*CO3*
26.	Why is the efficiency of worm gear drive low?	*2*	*K1*	*CO3*
27.	What is step ratio?	*2*	*K1*	*CO4*
28.	Draw the ray diagram for a six speed gear box.	*2*	*K2*	*CO4*
29.	Why heat-dissipation necessary in clutches?	*2*	*K1*	*CO5*
30.	State different types of brakes.	*2*	*K1*	*CO6*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31.	a)	Select a V-belt drive for 15 kW, 1440 rpm motor, which drives a centrifugal pump running at a speed of 576 rpm for a service of 8-10 hours per day. The distance between the driver and the driven shaft is approximately 1.2m.	*10*	*K3*	*CO1*
		OR			
	b)	Design a Chain Drive to actuate a compressor from a 15 kW electric motor at 970 rpm. The compressor speed is 350 rpm. Assume minimum center distance as 550 mm. The chain tension may be adjusted by shifting the motor on rails. The compressor is to work 8 hours a day.	*10*	*K3*	*CO1*
32.	a)	A Spur Gear Drive is required to transmit 20kW power at 450rpm with a speed reduction ratio of 3. Design the drive by assuming suitable materials.	*10*	*K3*	*CO2*
		OR			
	b)	Design a pair helical gear drive to transmit 10 kW at a pinion speed of 1000 rpm of the pinion. Speed ratio is 5. Take 40 Ni2 Cr1 Mo28 Steel as material for pinion and gear. Assume minimum number of teeth as 20 and tabulate the results.	*10*	*K3*	*CO2*

33. a) Design a Bevel Gear Drive to transmit 9 kW at 20 rps of the pinion. Gear ratio is 3. Material for Pinion & Wheel C 20 steel. Life is 10,000 hours. *10 K3 CO3*

OR

b) Design a worm gear drive to transmit a power of 22.5 KW. The worm speed is 1440 rpm and the speed of the wheel is 60 rpm. The drive should have a minimum efficiency of 80% and above. Select suitable materials for the worm and the wheel. *10 K3 CO3*

34. a) The maximum and minimum speed of a Six Speed Gear Box is 1600 rpm & 500 rpm respectively. Draw the speed diagram and kinematic arrangement. *10 K3 CO4*

OR

b) A 9 Speed Gear Box is to give output speeds ranging from 100 rpm to 630 rpm. Draw the Structural Diagram & Kinematic Layout. *10 K3 CO4*

35. 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. *10 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 springs are used. *10 K3 CO5*

36. a) A single block brake, as shown in Figure-1. has the drum diameter 250 mm. The angle of contact is 90° and the coefficient of friction between the drum and the lining is 0.35. If the force of 750N is applied at the end of the lever determine the torque that may be transmitted by the brake. *10 K3 CO6*

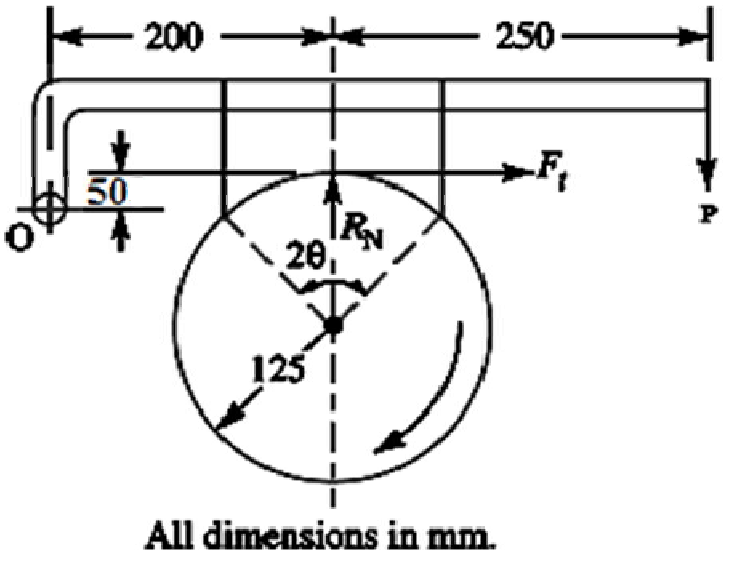

Figure-1.

OR

b) Refer to the Simple Band Brake shown in Figure-2 and assume the following data: b = 250mm; l=750mm; r = 250mm; θ =225°. The width of the friction lining is 60mm and the coefficient of friction is 0.4. The maximum intensity of pressure is 0.25N/mm^2. Calculate (i) the band tension; (ii) actuating force; (iii) the torque capacity of the brake. *10 K3 CO6*

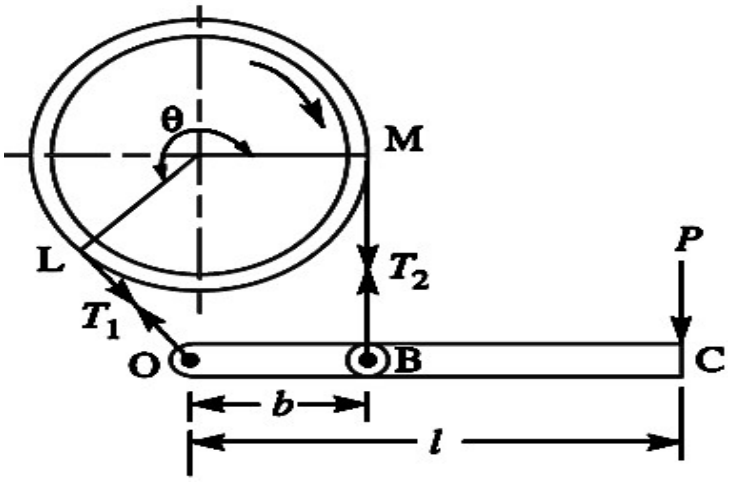

Figure-2.