Register Number:……..

KUMARAGURU college of technology
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B.E DEGREE EXAMINATIONS: NOV / DEC 2024

(Regulation 2018)

Fourth Semester

MECHATRONICS ENGINEERING

U18MCT4104:Theory of Machines

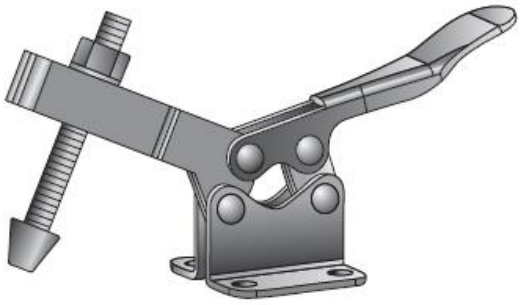
COURSE OUTCOMES

CO1: Apply concepts of mechanisms to achieve desired motion transformation.
CO2: Choose appropriate gear train and friction drives for a given application.
CO3: Calculate various forces acting on rigid bodies under static and dynamic conditions.
CO4: Solve balancing problems related to rotating and reciprocating masses.
CO5: Apply the fundamental concepts of vibrating system to predict the natural frequency and force transmitted.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	Determine the number of DoF for a given mechanism.	CO1	[K_3]



2.	List the types of kinematic pair.	CO1	[K_2]
3.	List the applications of epicyclic gear train.	CO2	[K_3]
4.	Brief the term diametral and circular pitch.	CO2	[K_2]
5.	Define inertia torque and inertia force.	CO3	[K_2]
6.	What do you meant by general plane motion.	CO3	[K_2]
7.	Differentiate static and dynamic balancing.	CO4	[K_3]
8.	How do you balance the unbalanced machinery?	CO4	[K_3]
9.	List the causes and effects of vibration.	CO5	[K_2]
10.	Define the term logarithmic decrement.	CO5	[K_2]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	a)	Discuss on inversion of the mechanism. Explain any one inversion with an application.	12	CO1	[K_2]
	b)	List and brief the types of constrain motion with a suitable sketch.	04	CO1	[K_2]
12.		The crank of a slider crank mechanism rotates clockwise at a constant speed of 300 r.p.m. The crank is 150 mm and the connecting rod is 600 mm long. Determine the angular velocity and angular acceleration of the connecting rod, at a crank angle of 45° from the inner dead centre position.	16	CO1	[K_3]
13.	a)	A pair of gears, having 40 and 20 teeth respectively, are rotating in mesh, the speed of the smaller being 2000 r.p.m. Determine the velocity of sliding between the gear teeth faces at the point of engagement, at the pitch point, and at the point of disengagement if the smaller gear is the driver. Assume that the gear teeth are 20° involute form, addendum length is 5 mm and the module is 5 mm.	12	CO2	[K_3]
	b)	Determine the power transmitted by a belt running over a pulley of 600 mm diameter at 200 r.p.m. The coefficient of friction between the belt and the pulley is 0.25, angle of lap 160° and maximum tension in the belt is 2500 N.	04	CO2	[K_3]
14.		The crank-pin circle radius of a horizontal engine is 300 mm. The mass of the reciprocating parts is 250 kg. When the crank has travelled 60° from I.D.C., the difference between the driving and the back pressures is 0.35 N/mm2. The connecting rod length between centres is 1.2 m and the cylinder bore is 0.5 m. If the engine runs at 250 r.p.m. and if the effect of piston rod diameter is neglected, calculate : 1. pressure on slide bars, 2. thrust in the connecting rod, 3. tangential force on the crank-pin, and 4. turning moment on the crank shaft.	16	CO3	[K_3]

15.	a.	A circular disc mounted on a shaft carries three attached masses of 4kg, 3kg and 2.5kg at radial distance of 75mm, 85mm, and 50mm. angular position of masses are measured counterclockwise from the reference line along x-axis that are 45˚, 135˚ and 240˚ respectively. Determine tha amount of the counter mass at a radial distance of 75mm required for the static balance.	06	CO4	[K_3]
	b.	Four masses A, B, C and D carried by a rotating shaft are at radii 100, 140, 210 and 160 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the masses of B, C and D are 16 kg, 10 kg and 8 kg respectively. Find the required mass A and the relative angular positions of the four masses so that shaft is in complete balance.	10	CO4	[K_3]
16.	a)	Discuss the different types of vibration with neat sketch.	06	CO5	[K_2]
	b)	A vibrating system consists of a mass of 200 kg, a spring of stiffness 80 N/mm and a damper with damping coefficient of 800 N/m/s. Determine the frequency of vibration of the system.	10	CO5	[K_3]

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