PVP 20

Code: 20ME3401

II B.Tech - II Semester – Regular / Supplementary Examinations
MAY - 2024

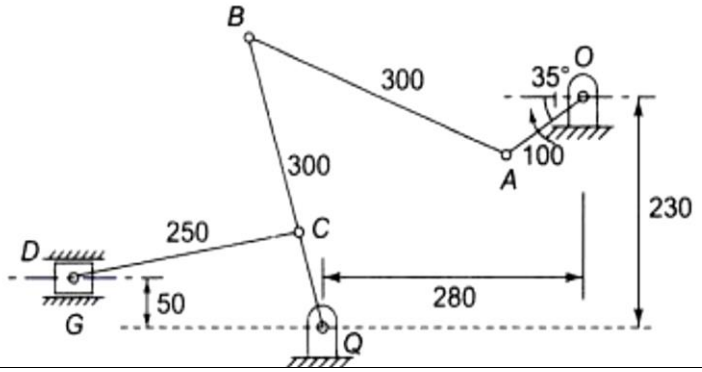
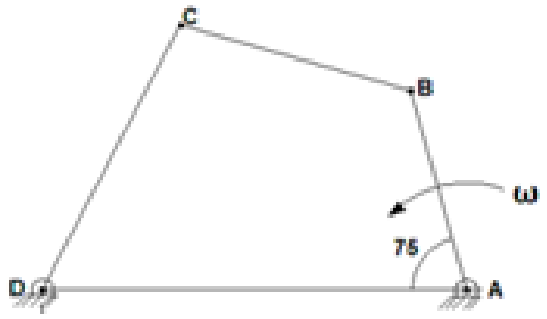
KINEMATICS OF MACHINERY
(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

BL – Blooms Level CO – Course Outcome

			BL	CO	Max. Marks
		UNIT-I			
1	a)	Define Kinematic Chain. Differentiate between Machine, Mechanism and Structure.	L2	CO1	7 M
	b)	Explain various types of constrained motions with a neat sketch.	L2	CO1	7 M
		OR			
2	a)	Describe the expression for mobility of mechanism in a plane.	L2	CO1	4 M
	b)	Explain all the inversions of a double slider crank chain with a neat sketch.	L2	CO1	10 M
		UNIT-II			
3	a)	State and prove Kennedy's theorem.	L2	CO2	4 M
	b)	Fig. shows a mechanism in which OA=QC=100mm, AB=QB=300mm and CD=250mm the crank OA rotates at 150 rpm in the clockwise direction. Determine the (i) velocity of slider at D (ii)Angular	L3	CO3	10 M

		velocities of links QB and AB (iii) Rubbing velocity at the pin B which is 40mm diameter. 			
OR					
4	a)	Explain the concept of Coriolis component of acceleration.	L2	CO2	2 M
	b)	In the mechanism shown in Figure below, the dimensions of various links (in mm) are: AB = 30; BC = 45; CD = 40; AD = 65; ∠ DAB = 75˚; The crank AB rotates at 600 rpm counter-clockwise. Draw the velocity and acceleration diagram of the given mechanism and find the velocity and acceleration of the each link. (The dimensions in the figure are in mm). 	L3	CO2	12 M
UNIT-III					
5	a)	Explain the working of Scotch Yoke Mechanism with a neat sketch. How can it be used to convert rotary motion into reciprocating motion?	L2	CO3	7 M

	b)	Illustrate a Paucellier mechanism. Based on mathematical condition examine either it traces a straight line path or not.	L3	CO3	7 M
		OR			
6	a)	Derive an expression for condition for perfect steering.	L3	CO3	7 M
	b)	A car with a wheel track of 147.2 cm and wheel base of 274 cm is fitted with an Ackermann's steering mechanism. The distance between the axis of the pivot pins is 122 cm and the tie–rod is 110.6 cm long. The track arm is 15.25 cm long. Find the turning circle radius of the car, so that true rolling motion is there for all the wheels.	L3	CO3	7 M
		UNIT-IV			
7	a)	What is a cam? Classify various types of cams.	L2	CO4	4 M
	b)	The follower of a tangent cam is operated through a roller of 50 mm diameter and its line of stroke intersects the axis of the cam. Minimum radius of the cam is 40 mm, nose radius is 12 mm, and the lift is 25 mm. If the speed of rotation of the cam is 800 rpm, find the velocity and acceleration of the follower at the instant when the cam is 25˚ from the full – lift position.	L3	CO4	10 M
		OR			
8	a)	Explain about types of followers.	L2	CO4	4 M
	b)	Use the following data in drawing the profile of a cam in which a knife-edged follower is raised with simple harmonic motion and is lowered with uniform	L3	CO4	10 M

		acceleration and retardation: Least radius of cam = 60 mm, Lift of follower = 45 mm, Angle of ascent = 60˚, Angle of dwell between ascent and descent = 40˚, Angle of descent = 75˚. If the cam rotates at 180 rpm, determine the maximum velocity and acceleration during ascent and descent.			
		UNIT-V			
9	a)	Derive an expression for constant velocity ratio of a given meshed gears.	L3	CO4	6 M
	b)	The number of teeth on the gear and the pinion of two spur gears in mesh are 30 and 18 respectively. Both the gears have a module of 6 mm and a pressure angle of 20˚. If the pinion rotates at 400 rpm, find the sliding velocity at the moment, the tip of the tooth of pinion has contact with the gear flank. Take addendum equal to one module. Also, find the maximum velocity of sliding.	L3	CO4	8 M
		OR			
10	a)	What is a reverted gear train? Explain any two applications.	L2	CO4	4 M
	b)	An epicyclic gear consists of a pinion, a wheel of 40 teeth and an annulus with 84 teeth concentric with the wheel. The pinion gears with the wheel and annulus. The arm that carries the axis of the pinion rotates at 100rpm. If the annulus is fixed, find the speed of the wheel.	L3	CO4	10 M