Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth Semester B.Tech Degree Regular and Supplementary Examination December 2020

Course Code: ME301

Course Name: MECHANICS OF MACHINERY

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any three full questions, each carries 10 marks. Marks

1 Explain with neat sketch, an application each of the four inversions of slider crank mechanism. 10

2 In a four-link mechanism, the crank AB rotates at 36 rad/s. the lengths of the links are AB = 200mm, BC = 400mm, CD = 450mm and AD = 600mm. AD is the fixed link. At the instant when AB is at right angles to AD, determine the velocity of the midpoint of link BC. 10

3 In a single slider crank mechanism, the lengths of the crank and connecting rod are 300 mm and 400 mm respectively. The slider is positioned in line to the crank axis at a distance of 500 mm. At a particular instant, the crank is inclined at 110^o with the line of motion of the slider. It is rotating with an angular velocity of 70 rad/s and angular acceleration 900 rad/s^2 in the clockwise direction. Compute the acceleration of the slider and angular acceleration of the connecting rod. 10

4 a) Sketch the displacement, velocity, acceleration and jerk diagrams of a cam follower which moves with cycloidal motion. 4

b) List the different types of cams based on their shape? Sketch any one type of cam. 6

PART B

Answer any three full questions, each carries 10 marks.

5 Design a cam profile as per the data given; 10

a) The least radius of the cam is 30 mm.

b) The cam is rotating a speed of 1600 rpm counter clockwise.

c) The axis of the knife edge follower is offset by 10 mm to the left.

d) The follower is provided a maximum lift of 40 mm during 160^o of the cam rotation subjected to constant acceleration and deceleration.

e) Dwell for the 40^o rotation of the cam.

f) Drop of the follower for the next 100^o rotation of the cam with SHM and followed by dwell.

6 a) Explain tangent cam with neat sketch. 3

b) Obtain the condition for minimum acceleration for a tangent cam with roller follower, when the roller is on the flank. 7

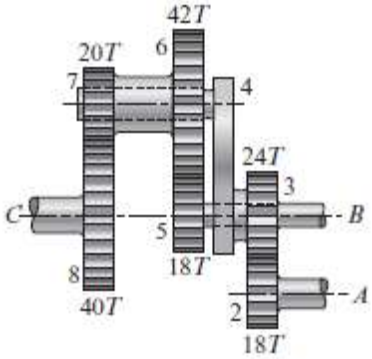
7 a) State and prove the law of gearing. 5

	b)	Distinguish between the cycloid and involute forms of gear teeth.	5
8		Derive an expression for the minimum number of teeth in an involute profile gear.	10

PART C

Answer any four full questions, each carries 10 marks.

9		In the given gear train, the shaft B is stationary and shaft C is driven at 380 rpm in the counter clockwise direction. Determine the speed and direction of rotation of shaft A.	10



10		a) Sketch a reverted gear train and epicyclic gear train.	4
		b) Establish the relation between speed ratio and train value of a simple gear train.	6
11	a	Discuss the method of determining the angles for input and output link in a four-bar mechanism for function generation with an example.	5
	b	The motions of the input and output links are related by the equation $y = x^2$. The range of x is from 1 to 4. Find x and y values using Chebychev spacing for five precision points.	5
12		In a slider crank mechanism, for the three position coordination, the angular displacements of the crank are 40^o and 100^o. The respective linear displacements of the slider are 120 mm and 220 mm. The eccentricity of the slider is 20 mm. Design the mechanism graphically.	10
13		Synthesize a four-bar mechanism to guide a rod (coupler) AB through three consecutive positions A_1B_1, A_2B_2 and A_3B_3 as follows. A_1 (3,0), B_1 (3,5), A_2 (11,7), B_2 (6,7), A_3 (5,2) and B_3 (8,6)	10
14		The motions of the input and output links of a four-bar mechanism are governed by the function $y = 3x^2$. The x varies from 1 to 3 with an interval of 1. Assume the input angle varies from 30^o to 110^o and output angle varies from 70^o to 130^o. Synthesize the mechanism using Freudenstien's equation.	10

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