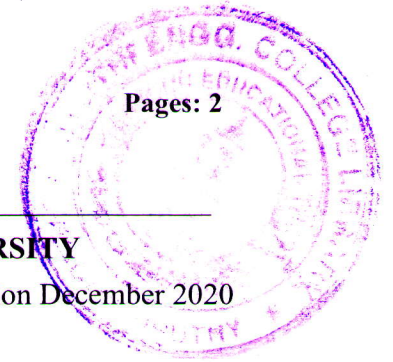


Reg No.: _____

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° 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.
b) List the different types of cams based on their shape? Sketch any one type of cam. | 4
6 |

PART B*Answer any three full questions, each carries 10 marks.*

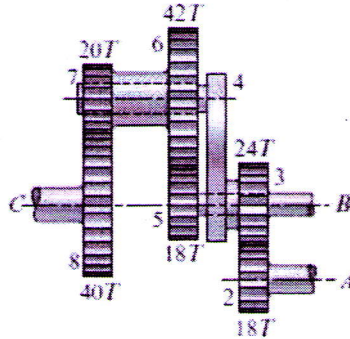
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|---|---|--------|
| 5 | Design a cam profile as per the data given;
a) The least radius of the cam is 30 mm.
b) The cam is rotating a speed of 1600 rpm counter clockwise.
c) The axis of the knife edge follower is offset by 10 mm to the left.
d) The follower is provided a maximum lift of 40 mm during 160° of the cam rotation subjected to constant acceleration and deceleration.
e) Dwell for the 40° rotation of the cam.
f) Drop of the follower for the next 100° rotation of the cam with SHM and followed by dwell. | 10 |
| 6 | a) Explain tangent cam with neat sketch.
b) Obtain the condition for minimum acceleration for a tangent cam with roller follower, when the roller is on the flank. | 3
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° and 100° . 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. 10
 $A_1(3,0)$, $B_1(3,5)$, $A_2(11,7)$, $B_2(6,7)$, $A_3(5,2)$ and $B_3(8,6)$
- 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° to 110° and output angle varies from 70° to 130° . Synthesize the mechanism using Freudenstien's equation. 10
