

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019**

**Course Code: ME301**

**Course Name: MECHANICS OF MACHINERY**

Max. Marks: 100

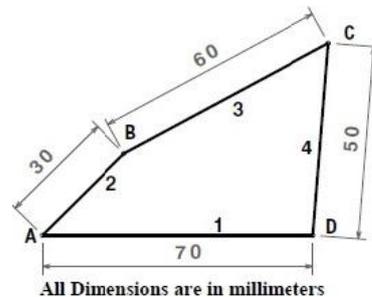
Duration: 3 Hours

**PART A**

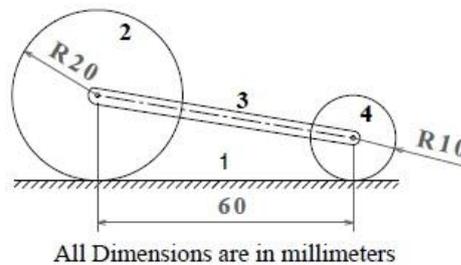
*Answer any three full questions, each carries 10marks.*

Marks

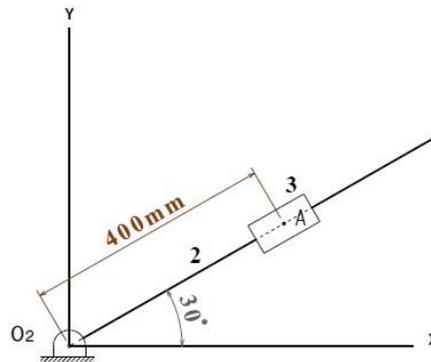
- 1 A four bar kinematic chain is shown in figure. Draw its inversions, identify the mechanism and describe the nature of motion of each links in each case. (10)



- 2 a) State and Prove Kennedy's theorem (5)  
 b) Locate all the instantaneous centres of the mechanism shown in figure (5)



- 3 a) What do you mean by Coriolis component of acceleration? How is its direction found out? (5)  
 b) In the figure shown below, the slider block 3 slides outwards on link 2 at a uniform rate of 20m/s, while link 2 is rotating at a constant angular velocity of 50rad/s counter clockwise. Determine the acceleration of point A of the block (5)



- 4 a) Define the following terms as applied to a cam with a neat sketch (5)
- i) Prime circle
  - ii) Pressure angle
- b) Derive the expression for velocity and acceleration when the follower moves with simple harmonic motion (5)

### PART B

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

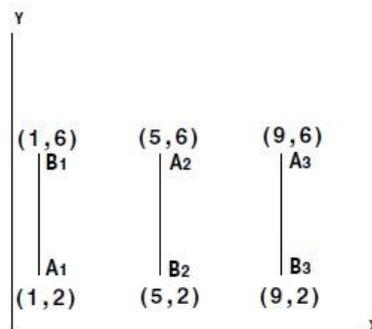
- 5 A cam drives a flat reciprocating follower in the following manner. During first  $120^\circ$  rotation of the cam, follower moves outwards through a distance of 20mm with simple harmonic motion. The follower dwells during next  $30^\circ$  of cam rotation. During next  $120^\circ$  of cam rotation, the follower moves inwards with simple harmonic motion. The follower dwells for the next  $90^\circ$  of cam rotation. The minimum radius of the cam is 25mm. Draw the profile of the cam. (10)
- 6 A symmetrical circular cam operating a flat faced follower has the following particulars: (10)
- Minimum radius=30mm, Lift  $h=20$ mm, Angle of ascent  $\beta=75^\circ$ , Nose radius=5mm, Speed=600 rpm
- Find
- i) the principal dimensions of the cam
  - ii) the acceleration of the follower at the beginning of the lift, at the end of contact with circular flank, at the beginning of contact with nose and at the apex of the nose
- 7 A pair of  $20^\circ$  full depth involute spur gears having 30 and 50 teeth respectively of module 4mm in mesh. The smaller gear rotates at 1000rpm. Take addendum = 1 module. Find (10)
- i) Sliding velocity at engagement and at disengagement of pair of a teeth
  - ii) Contact ratio.

- 8 a) Obtain the relations to find calculate the pitch angles of bevel gears (5)  
 b) What do you mean by interference? What are its effects? (5)

**PART C**

*Answer any four full questions, each carries 10marks.*

- 9 An epicyclic gear consists of a pinion, a wheel of 40 teeth and an annulus with 84 internal teeth concentric with the wheel. The pinion gears with the wheel and the annulus. The arm that carries the axis of the pinion rotates at 100 rpm. If the annulus is fixed, find the speed of the wheel; if the wheel is fixed, find the speed of the annulus. (10)
- 10 Explain the working of a differential with the help of a diagram and show that the speed of crown gear is the arithmetic mean of the sun gears (10)
- 11 a) A function varies from 0 to 10. Find the Chebychev spacing for six precision points. (5)  
 b) Explain the overlay method of synthesis. (5)
- 12 Design a four bar linkage to generate the function  $y = e^x - x$  for  $0 \leq x \leq 1$  using three precision points (10)
- 13 Design a four bar crank rocker to give  $60^\circ$  of rocker rotation with equal time forward and backward from a constant speed motor input (10)
- 14 Synthesize a four bar mechanism to guide a rod AB through three consecutive positions  $A_1B_1$ ,  $A_2B_2$  and  $A_3B_3$  as shown in figure (10)



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