



R18 Regulation

Subject code: 2P3CC

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech III Semester Regular Examinations, NOV/DEC 2019

## KINEMATICS OF MACHINERY

(MECHANICAL ENGINEERING)

Maximum Marks: 70

Date: 28.11.2019 Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
  2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
  3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
  4. Each question carries 10 marks and may have a, b, c, d as sub questions.

### Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

1. Classify the kinematic pairs and give example for each type
2. Differentiate mechanism and machine.
3. Locate all I-centers for a Four bar mechanism at one of its configurations
4. State Kennedy's theorem of three centers in line
5. Explain Hart and Scott Russel straight line motion mechanism
6. Differentiate Davis and Ackermann steering gear mechanisms
7. Explain the displacement line diagram for uniform velocity type of follower motion
8. Classify the followers.
9. Differentiate Cycloidal and Involute forms of tooth profiles
10. Derive the equation for train value in a compound gear train

### Part-B

Answer All the following questions.

(10MX 5=50Marks)

11. Write the inversions of double slider crank chain and explain with neat diagrams  
OR
12. a) Differentiate and give the examples.  
i) lower and higher pairs ii) turning and rolling pairs.  
b) What are quick-return mechanisms? Describe with sketch working of two different types of quick return mechanisms. Give the applications of these mechanisms
13. In the toggle mechanism, as shown in fig.1 the slider D is constrained to move on a horizontal path. The crank OA is rotating in the counter-clockwise direction at a speed of 180 rpm. The dimensions of various links are as follows: OA = 180 mm; CB = 240 mm; AB = 360 mm; and BD = 540 mm. For the given configuration, find;  
i). Velocity of a slider D and angular velocity of link BD;  
ii). Acceleration of a slider D and angular acceleration of link BD.



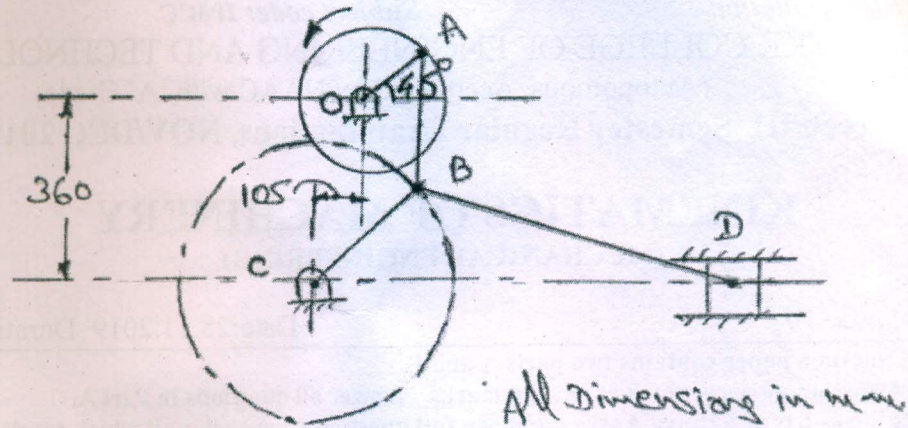


Figure no.1

OR

- 14 What is coriolis acceleration component? In which cases does it occur? Derive the equation for finding its magnitude and state the direction how does it act?
- 15 (a) The two shafts of a Hooke's joint have their axes inclined at  $20^\circ$ . The shaft A revolves at a uniform speed of 1000rpm. The shaft B carries a flywheel of mass 30kg. If the radius of gyration of the flywheel is 100 mm, find the maximum torque in shaft B.[5M]

(b) Sketch and explain the Pantograph mechanism [5M]

OR

- 16 a)What is fundamental equation of steering gears? What are its types? Which steering gear is preferred and Why? [5M]  
b) Explain with neat sketch about peaucellier mechanism [5M]
- 17 A cam is required to give motion to a follower fitted with a roller 30mm in diameter. The lift of the follower is 35mm and is performed
- With uniform acceleration for cam rotation  $45^\circ$
  - With uniform retardation for cam rotation  $60^\circ$

The follower falls through immediately with simple harmonic motion while the cam turns  $120^\circ$ . Then a period of dwell is followed for remaining rotation of the cam. The least radius of the cam is 25mm. The line of motion of the follower passes through the center of the cam axis. Construct the cam profile.

OR

- 18 Draw the profile of a cam operating a roller reciprocating follower having a lift of 35mm. The line of stroke of the follower passes through the axis of the cam shaft. The radius of the roller is 10mm and the minimum radius of the cam is 40mm. The cam rotates at 630 rpm counter-clockwise. The follower is raised with cycloidal motion for  $90^\circ$  of the cam rotation, dwells for next  $60^\circ$  and then lowers with uniform acceleration and deceleration for the next  $150^\circ$ . The follower dwells for the rest of the cam rotation.

Also, draw the displacement, velocity and the acceleration diagrams for the motion of the follower for one complete revolution of the cam indicating main values.



- 19 What is meant by Interference in involute gears? Derive a relation for minimum number of teeth on the gear wheel and the pinion to avoid interference.

OR

- 20 A epicyclic gear train consists of five gears A, B, C, D and E as shown in figure 2. The wheels A and B as well as internal wheels C and D rotate independently about the axis O. The wheels E and F rotate on the pins fixed to arm a. All the wheels are of same module. The number of teeth on wheels A, B, E and F are 52, 56, 36 and 36 respectively. Determine the speed of C if
- (i) the wheel D fixed and arm a rotates at 200 rpm clock wise
  - (ii) the wheel D rotates at 20 rpm counter clock wise and the arm a rotates at 200 rpm clock wise

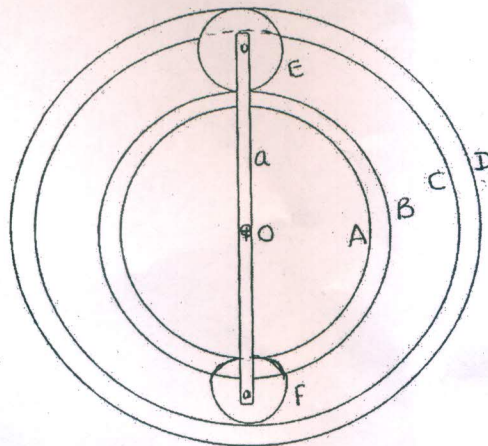


Figure: 2.