TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech III Semester Regular/Supplementary Examinations, February 2021

KINEMATICS OF MACHINERY
(MECHANICAL ENGINEERING)

Maximum Marks: 70   Date: 19.02.2021 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   What is the significance of degrees of freedom of a kinematic chain when it functions as a mechanism?
2   Compare machine and structure.
3   What do you mean by instantaneous center? What are its properties?
4   What is the acceleration diagram of a slider crank mechanism.
5   What is a Hooke's joint and where is it used?
6   Explain the conditions for correct steering.
7   Explain the application of cam in the mechanisms.
8   Write the different types of follower motions.
9   What do you mean by interference in gears? What are methods to avoid interference?
10 What is the function of a differential gear of an automobile?

Part-B

Answer All the following questions.   **(10MX 5=50Marks)**

11   A. Explain the classification of kinematic pairs with the help of examples(5M)
        B. Explain the inversion of double slider crank mechanism which is used in elliptical trammel.(5M)

                              OR

12   A crank and slotted lever mechanism used in a shaper has a centre distance of 300 mm between the centre of oscillation of the slotted lever and the centre of rotation of the crank. The radius of the crank is 120 mm. Find the ratio of the time of cutting to the time of return stroke. (10M)

13   State the Coriolis Component of Acceleration. (10M)
   OR
14   Locate all the instantaneous centers of the slider crank mechanism as shown in figure below. The lengths of crank OB and connecting rod AB are 100 mm and 400 mm respectively. If the crank rotates clockwise with an angular velocity of 10 rad/s, find: (i) Velocity of the slider A. (ii) Angular velocity of the connecting rod AB.(10M)
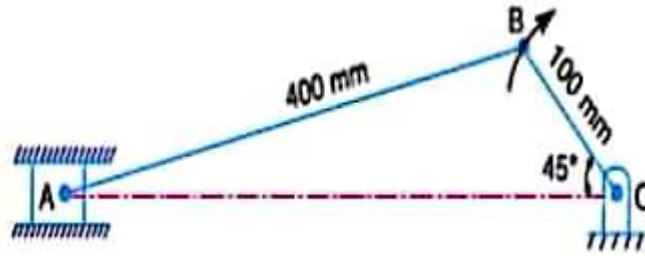
15   A. Why Ackerman steering gear is preferred to the Davis steering gear mechanism.(5M)
      B. Explain the following with neat sketch.(5M)
         Scott-Russell Exact Straight-Line Mechanism
         Peaucellier Exact Straight-Line Mechanism

                                          OR

16   In a Grass-Hopper mechanism shown in figure , the link lengths are: OQ = 100 mm, SP = 375 mm, QS = 150 mm, and SR = 225 mm. Find the magnitude of the vertical force necessary at P to resist a torque of 120 N-m applied to the link OQ when it makes an angle of 150 with the horizontal. (10M)
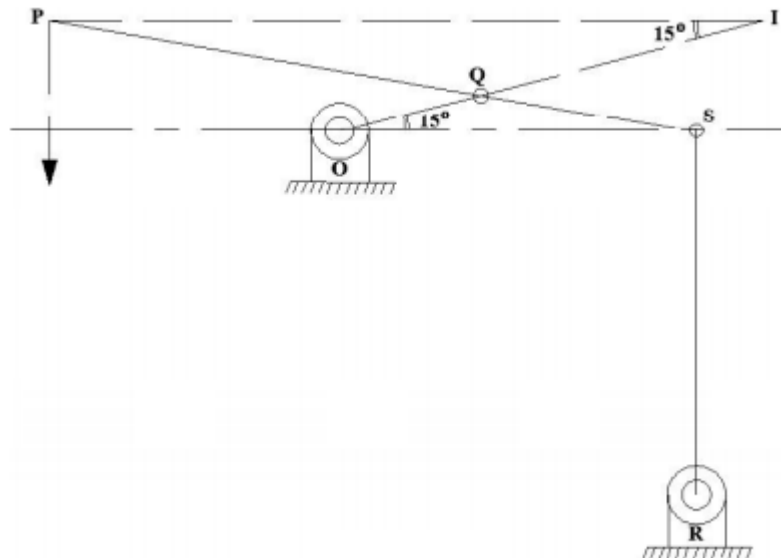
17   Draw the profile of a cam operating a roller reciprocating follower and with the following data:
         Minimum radius of a cam = 25 mm
         Lift = 30 mm
         Roller diameter = 15 mm
      The cam lifts the follower for 120^0 with SHM followed by a dwell period of 30^0 . Then the follower lowers down during 150^0 of the cam rotation at a uniform speed of 150 r.p.m, calculate the maximum velocity and acceleration of the follower during the descent period.(10M)

                                          OR

18   A cam rotating clockwise at uniform speed of 300 rpm operates a reciprocating follower through a roller 15 mm diameter. The follower motion is defined as below;
> a) Outward during 150 with UARM. b) Dwell for the next 30 .
> c) Return during next 120 with SHM. d) Dwell for the remaining period.

Stroke of the follower is 30 mm. Minimum radius of the cam is 30 mm. Draw the profile of the cam when follower axis passes through the cam axis(10M)

19   An epicyclic gear train is constructed as follows. A fixed annular wheel A and a smaller concentric wheel B are connected by a compound wheel C & D. C gearing with A, D gearing with B. The compound wheel revolves on a stud which is carried around an arm which revolves about the axis A and B. A has 130 teeth, B = 20 teeth, D = 80 teeth, pitch of A and C being twice that of pitch of B and D. How many revolutions B will make for one revolution of arm? (10M)

<div align="center">OR</div>

20   The following data relate to a pair of 20° involute gears in mesh: Module = 6 mm, Number of teeth on pinion = 17, Number of teeth on gear = 49; Addenda on pinion and gear wheel = 1 module. Find:
> a) The number of pairs of teeth in contact;
> b) The angle turned through by the pinion and the gear wheel when one pair of teeth is in contact, and
> c)The ratio of sliding to rolling motion when the tip of a tooth on the larger wheel
>   (i) is just making contact, (ii) is just leaving contact with its mating tooth, and
> (iii) is at the pitch point.   (10M)