II B. Tech II Semester Regular/Supplementary Examinations, November - 2020
KINEMATICS OF MACHINARY
(Com to ME, AME, MIN)

Time: 3 hours   Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
        2. Answer **ALL** the question in **Part-A**
        3. Answer any **FOUR** Questions from **Part-B**
~~~~~~

PART –A

1. a) What is the difference between a mechanism and a structure?   (2M)

   b) What are the limitations of a single Hooke's joint?   (2M)

   c) State and prove Kennedy's theorem of instantaneous centers of rotation of three bodies.   (3M)

   d) Enumerate the various types of follower motions used in cam mechanisms.   (3M)

   e) State the advantages of involute profile as a gear tooth profile.   (2M)

   f) With a suitable sketch, differentiate between simple gear train and a compound gear train.   (2M)

PART -B

2. a) Use the Kutzbach's criterion to determine the mobility of the mechanism shown in figure 1.   (6M)
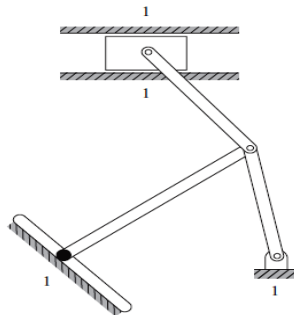

Figure 1

   b) What are the quick return mechanisms? Discuss the functioning of any two of them.   (8M)

3. a) What is an automobile steering gear? Derive the condition for correct steering of an automobile?   (6M)

   b) Draw a neat sketch of the Scott Russell's mechanism, and explain its working. How this mechanism can be modified to produce Grasshopper mechanism.   (8M)

4. In a four bar mechanism ABCD, link AD is fixed and the crank AB rotates at 10 rad/s clockwise. Lengths of the links are AB = 60 mm; BC = CD = 70 mm; DA = 120 mm. When angle DAB = 60° and both B and C lie on the same side of AD, find angular velocities and angular acceleration of BC and CD.   (14M)

||"|"||"||"""|

5.   Use the following data in drawing the profile of a cam in which a knife-edged follower is raised with uniform acceleration and deceleration and is lowered with simple harmonic motion: (14M)
Least radius of cam = 60 mm; Lift of follower = 45 mm; Angle of ascent = 60^0;
Angle of dwell between ascent and descent = 40^0;Angle of descent = 75^0
If the cam rotates at 180 rpm, determine the maximum velocity and acceleration during ascent and descent.

6. a) Prove that the transmission ratio of two involute gears does not depend on the center distance between them.   (6M)
   b) A pinion with 24 involute teeth of 150 mm pitch circle diameter drives a rack. The addendum of the pinion and rack is 6 mm. What is the least pressure angle which can be used if interference is to be avoided? Using this pressure angle, find the length of arc of contact and the number of teeth in contact.   (8M)

7.   An open belt drive connects two pulleys 1 m and 0.5 m diameter on parallel shafts 3 m apart. The belt has a mass of 1 kg/m length and the maximum tension in it is not to exceed 2 kN. The 1 m pulley, which is the driver, runs at 200 rpm. Due to the belt slip on one of the pulleys, the velocity of the driven shaft is only 450 rpm. If the coefficient of friction between the belt and the pulley is 0.3, find: i) Torque on each of the two shafts, ii). Power transmitted iii). Power lost in friction and iv). Efficiency of the drive.   (14M)

||"|"||"||"""|