INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal-500043, Hyderabad

B.Tech IV SEMESTER END EXAMINATIONS (REGULAR) - JULY 2022
Regulation:UG20
KINEMATICS OF MACHINES

Time: 3 Hours   (MECHANICAL ENGINEERING)   Max Marks: **70**

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
(NOTE: Provision is given to answer TWO questions from among one of the Modules III / IV / V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Write a short note on kinematic pair. Explain briefly types of constrained motions.
    [BL: Understand| CO: 1|Marks: **7**]

    (b) Determine the degree of freedom of the mechanism given Figure 1.   [BL: Apply| CO: 1|Marks: **7**]

Figure 1

MODULE – II

2. (a) What is instantaneous center? Explain three types of instantaneous centers in detail.
    [BL: Understand| CO: 2|Marks: **7**]

    (b) A four bar mechanism ABCD is made up of four links, pin jointed at the ends. AD is fixed link which is 180 mm long. The links AB, BC and CD are 90 mm, 120 mm long. At certain instant, the link AB makes an angle 60^0 with the link AD. If the link AB rotates at a uniform speed of 100 rpm clockwise determine angular velocity of the link BC and CD.   [BL: Apply| CO: 2|Marks: **7**]

MODULE – III

3. (a) Enumerate straight-line mechanisms. Why are they classified into exact and approximate straight-line mechanisms? [BL: Understand| CO: 3|Marks: **7**]

    (b) A double hooke joint is used to connect two shafts in the same plane. The intermediate shaft is inclined at an angle of 20° to the driving shaft as well as the driven shaft. Find the maximum and minimum speed of the intermediate shaft and the driven shaft if the driving shaft has a constant speed of 500 r.p.m. [BL: Apply| CO: 3|Marks: **7**]

4. (a) Sketch the Peaucellier's straight line mechanism. Explain the principle of generation of straight line. [BL: Understand| CO: 4|Marks: 7]

   (b) With the help of neat sketch discuss a ackermann steering gear. Differentiate between Davi's and Ackerman steering gears. [BL: Apply| CO: 4|Marks: 7]

MODULE – IV

5. (a) Write a short note on Cam. Explain briefly classification of follower according to the surface in contact or shape of follower. [BL: Understand| CO: 5|Marks: 7]

   (b) A Cam with 3 cm as minimum radius is rotating clockwise at a uniform speed of 1200 rpm and has to give the motion to the knife edge follower as defined below. (i) Follower to move outward through 3 cm during 120° of Cam rotation with SHM. (ii) Dwell for the next 60° (iii) Follower to return to its starting position during the next 90° with uniform acceleration and retardation motion (iv) Dwell for the remaining period. Draw the cam profile for follower axis passes through cam axis. [BL: Apply| CO: 5|Marks: 7]

6. (a) Deduce expression for the displacement and velocity of the follower when it moves with simple harmonic motion. [BL: Understand| CO: 5|Marks: 7]

   (b) It is required to set out the profile of a Cam to give the following motion to the reciprocating follower with a flat contact face : i) Follower to have a stroke of 20 mm during 120° of cam rotation; ii) Follower to dwell for 30° of cam rotation; iii) Follower to return to its initial position during 120° of cam rotation; iv) Follower to dwell for remaining 90° of cam rotation. The minimum radius of the cam is 25 mm. The out stroke and return stroke of the follower is performed with simple harmonic motion. [BL: Apply| CO: 5|Marks: 7]

MODULE – V

7. (a) Explain the method of eliminating interference in gears. State the advantages of involute and cylcoidal gears. [BL: Understand| CO: 6|Marks: 7]

   (b) Two parallel shafts, about 600 mm apart are to be connected by spur gears. One shaft is to run at 360 rpm. and the other at 120 rpm. Design the gears, if the circular pitch is to be 25 mm.
   [BL: Apply| CO: 6|Marks: 7]

8. (a) Describe pressure angle of gears. Classify the gears according to the position of axes of the shafts.
   [BL: Understand| CO: 6|Marks: 7]

   (b) An epicyclic gear consists of three gears A, B and C as shown in Figure 2. The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of A at 18 rpm. If the gear A is fixed, determine the speed of gears B and C. [BL: Apply| CO: 6|Marks: 7]
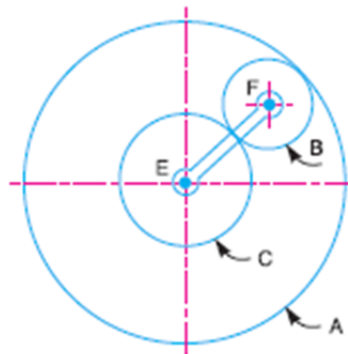

Figure 2