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Code No. : 22412

VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD
B.E. (Mech. Engg.) II Year II-Semester Main & Backlog Examinations, May-2017

Kinematics of Machines

Time: 3 hours

Max. Marks: 70

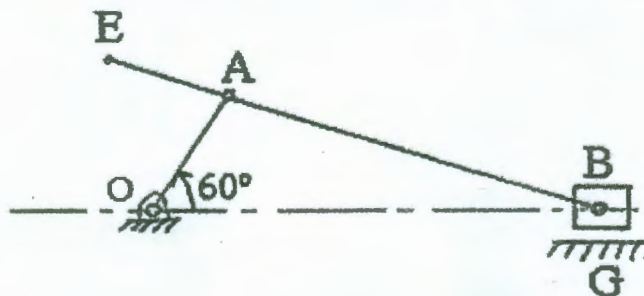
Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

1. An assortment of five links lengths 5cms, 8cms, 15cms, 19cms and 28cms is available for constructing a crank rocker 4 bar mechanism. Choose any 4 links and Sketch the crank rocker mechanism, indicating the crank and showing all the link lengths.
2. State Grashoff's law.
3. What is Coriolis component of acceleration, when does it occur and how is it determined?
4. Draw a four bar planar mechanism with all revolute joints and locate all instantaneous centers.
5. Enumerate relative merits and demerits of roller types of followers in cam mechanisms.
6. Define the following terms used in cam and follower mechanism.
a. Prime circle b. Pitch point c. Pressure angle d. Base circle
7. What is the effect of centrifugal tension of the belts on the power transmitted by them?
8. Discuss about types of open belt drives.
9. Differentiate between Involute and cycloidal type of tooth profiles in gears.
10. State law of gear tooth action.

Part-B (5 × 10 = 50 Marks)

11. a) Define what is meant by Inversion of a Mechanism. Discuss with suitable sketches the various inversions of slider-crank chain stating the actual machines in which these are used in practice. [5]
b) Derive the fundamental equation of steering gears and enumerate the relative merits and demerits of each of the Davis and Ackermann steering gear mechanisms. [5]
12. In a slider – crank mechanism, the crank is 480 mm long and rotates at 20 rad/sec in counter clockwise direction. The length of the connecting rod is 1.6 m. When the crank turns 60° from the inner dead – center, determine
a) Velocity of the slider. [5]
b) Velocity of point E located at a distance 450 mm on the connecting rod extended. [5]



13. a) Draw the profile of the cam when the roller follower moves with cycloidal motion as given below: [10]
- Outstroke with maximum displacement of 44 mm during 180° of cam rotation.
 - Return stroke for the next 150° of cam rotation.
 - Dwell for the remaining 30° of cam rotation.
- The minimum radius of the cam is 20 mm and the diameter of the roller is 10 mm. The axis of the roller follower passes through the cam shaft center.
14. a) The power transmitted between two shafts 3.5 meters apart by a cross belt drive round the two pulleys 600 mm and 300 mm in diameters, is 6 kW. The speed of the larger pulley (driver) is 220 r.p.m. The permissible load on the belt is 25 N/mm, belt is 5 mm thick. The coefficient of friction between the smaller pulley surface and the belt is 0.35. [7]
- Estimate:
- Necessary length of the belt.
 - Width of the belt, and
 - Necessary initial tension in the belt.
- b) Discuss about classification of chains. [3]
15. a) Two 25° involute spur gears having a velocity ratio of 3 mesh externally. The module is 5 mm and the addendum is equal to 1.2 module. The pinion rotates at 250 r.p.m. [6]
- Calculate
- minimum number of teeth on each wheel to avoid interference
 - no. of pairs of teeth in contact.
- b) An epicyclic gear train consists of an arm and two gears A and B having 30 and 40 teeth respectively. The arm rotates about the center of the gear A at a speed of 80 rpm counterclockwise. Determine the speed of the gear B if (i) the gear A is fixed, and (ii) the gear A revolves at 240 rpm clockwise instead of being fixed. [4]
16. a) Discuss any one type of exact straight line mechanism. [5]
- b) Discuss with sketch, the instantaneous center method for determination of velocities of links in a given mechanism. Take any mechanism as an example. [5]
17. Answer any *two* of the following:
- Draw the displacement, velocity and acceleration diagrams for a follower moving with uniform acceleration and retardation during its rise. [5]
 - Derive the relation for ratio of belt tensions in a V-belt drive, also determine the conditions for maximum power transmission. [5]
 - Discuss about different types of gear trains. [5]
