

B.Tech II Year II Semester (R15) Supplementary Examinations December 2018

KINEMATICS OF MACHINES

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

PART – A
(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
 - (a) Distinguish the terms completely and successfully constrained motions.
 - (b) Differentiate exact and approximate straight line motion mechanisms by giving examples.
 - (c) What is the condition for correct steering?
 - (d) Define the terms slip and creep in case of belt drives.
 - (e) What is the use of Klein's construction?
 - (f) Explain the Coriolis acceleration component.
 - (g) State the condition for constant velocity ratio for transmission of motion for gear drive.
 - (h) Write the significance of epicyclic gear trains.
 - (i) Define terms pitch circle and pitch curve relevant to cams.
 - (j) What are the various stages of follower motion with respect to cam rotation angle?

PART – B
(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

- 2 Write the inversions of double slider crank mechanism and explain any two of them with neat sketches.
- OR
- 3 Explain and prove that the Peaucellier mechanism is used for generating exact straight line motion.

UNIT – II

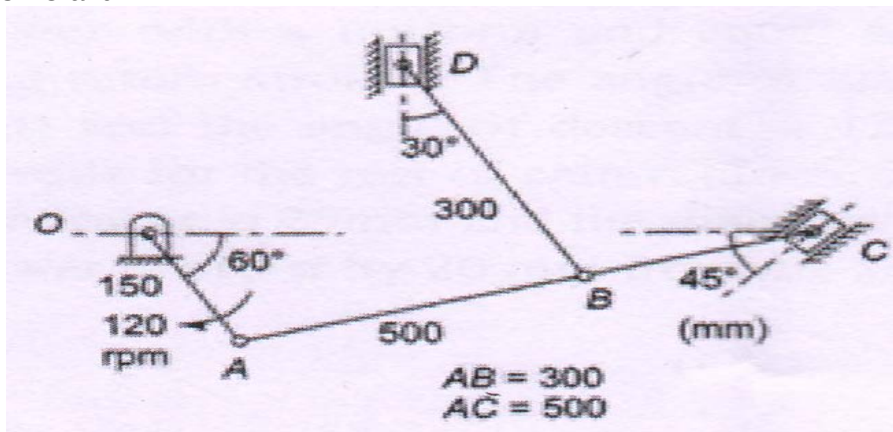
- 4 (a) What is an automobile steering gear? What are its types? Which steering gear is preferred and why?
- (b) Derive the condition for correct steering of an automobile.

OR

- 5 For an open belt drive, the mass of the belt is 2 kg per meter length and the coefficient of friction between belt and pulley surface is 0.35. The driver pulley diameter is 300 mm and is running at 720 rpm and driven pulley diameter is 900 mm. The centre distance between the pulleys is 2000 mm. Calculate:
 - (i) The tension on the tight and loose sides.
 - (ii) The length of the belt. The belt is transmitting 35 kW power.

UNIT – III

- 6 For the four-link mechanism shown in figure the linear velocities of sliders C & D and the angular velocities of links AC and BD.



OR

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- 7 In a four bar chain ABCD, AD is the fixed link 12 cm long, crank AB is 3 cm long and rotates uniformly at 100 r.p.m clockwise while the link CD is 6 cm long and oscillates about D. Link BC is equal to link AD. Find the angular velocity of link DC when angle BAD is 60° .

UNIT – IV

- 8 Two gears in mesh have a module of 10 mm and a pressure angle of 25° . The pinion has 20 teeth and the gear has 52. The addendum on both the gears is equal to one module. Determine the: (i) Number of pairs of teeth in contact. (ii) Angles of action of the pinion and the wheel. (iii) Ratio of the sliding velocity to the rolling velocity at the pitch point and at the beginning and end of engagement.

OR

- 9 An epicyclic gear consists of a pinion, a wheel of 40 teeth and an annulus with 84 internal teeth concentric with the wheel. The pinion gears with the wheel and the annulus. The arm that carries the axis of the pinion rotates at 100 rpm. If the annulus is fixed, find the speed of the wheel; if wheel is fixed, find the speed of the annulus.

UNIT – V

- 10 A cam rotating clockwise at a uniform speed of 200 rpm is required to move an offset roller follower with a uniform and equal acceleration and retardation on both the outward and return strokes. The angle of ascent, the angle of dwell (between ascent and descent) and the angle of descent is 120° , 60° and 90° degrees respectively. The follower dwells for the rest of cam rotation. The least radius of the cam is 50 mm, the lift of the follower is 25 mm and the diameter of the roller is 10 mm. The line of stroke of the follower is offset by 20 mm from the axis of the cam. Draw the cam profile.

OR

- 11 Lay out the profile of a cam so that the follower:
- Is moved outwards through 30 mm during 180° of cam rotation with cycloidal motion.
 - Dwells for 20° of the cam rotation.
 - Returns with uniform velocity during the remaining 160° of the cam rotation.
- The base circle diameter of the cam is 28 mm and the roller diameter 8 mm. The axis of the follower is offset by 6 mm to the left. What will be the maximum velocity and acceleration of the follower during the outstroke if the cam rotates at 1500 rpm counter-clockwise?
