R09

Code No: 54014
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, November/December - 2015
KINEMATICS OF MACHINERY
(Common to ME, MCT, AME)
Time: 3 hours   Max. Marks: 75

Answer any five questions
All questions carry equal marks
Illustrate your answers with NEAT sketches wherever necessary

1.a) Distinguish between the rolling, screw and spherical types of kinematic pairs.
 b) In a four – bar mechanism, the lengths of driver crank, coupler, and follower link are 175 mm, 275 mm, and 300 mm respectively. Length of the fixed link is L_o. Determine the range of values for L_o so as to make it a
i) Crank – Rocker mechanism, ii) Double – Crank mechanism.   [6+9]

2.a) Draw the sketch of Scott – Russell mechanism and explain its working. What is its limitation and how is it modified?
 b) Show that in Watt's straight line motion mechanism, the tracing point on the coupler divides it in the ratio of the length of the oscillating links which are connected by it.   [8+7]

3.a) Explain with proof the Klein's construction to obtain the velocity of connecting rod in a single – slider crank chain mechanism.
 b) What is 'Coriolis component of acceleration', and when does it occur?
 c) For the mechanism shown in Figure, find the angular velocity of the link AB by Instantaneous centre method.   [6+4+5]
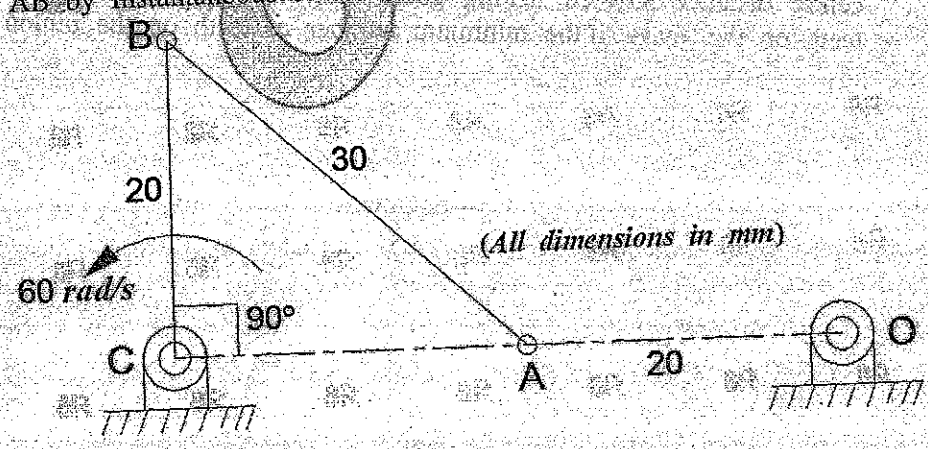
4.a) Draw the sketch of Ackermann's steering gear mechanism, and show that it will satisfy the condition for correct steering for three positions only. In spite of this limitation, it is preferred to the Davis steering gear – Why? Give reasons.
 b) In a double Hooke's joint connecting two shafts, the intermediate shaft is inclined at 10^0 to each shaft. The input and output forks on the intermediate shaft have been assembled inadvertently at 90^0 to one another. Determine the maximum and minimum speeds of the output shaft if the speed of the input shaft is 50 rpm.   [8+7]

5. Draw the profile of a cam to suit the motion of a 3 cm diameter roller follower as per the following data:
Outward stroke of the roller occurs with SHM during 160^0 of cam rotation; Dwell for the next 30^0 of cam rotation; Return stroke occurs with uniform and equal acceleration and retardation during 150^0 of cam rotation; Dwell for the remaining period of cam rotation. Minimum radius of the cam is 5 cm, and maximum lift of the follower is 4 cm. The cam rotates at a uniform speed in *cw* direction, and the line of stroke of follower is offset by 0.75 cm from the axis of the cam. [15]

6.a) What is the effect of centrifugal tension on the tight and slack sides of a belt drive? Show that it is independent of the tight and slack side tensions and depends only on the velocity of the belt over the pulley.

b) Two pulleys of diameters 450 mm and 200 mm are on parallel shafts which are 2 meters apart. They are connected by a crossed belt. Find the belt length required, and the angle of contact between the belt and each pulley. [8+7]

7.a) Sketch a pair of meshing involute profile gear teeth, and show on that the following:
addendum, dedendum, clearance, circular pitch, pressure angle and pitch point.

b) Two 20^0 involute spur gears having a velocity ratio of 2.5 mesh externally. The module is 4 mm, and addendum is equal to 1.23 module. If the pinion rotates at 150 rpm, find the minimum number of teeth on each wheel to avoid interference. [8+7]

8.a) Sketch and explain the working of differential gear of an automobile.

b) A four – speed sliding-gear box is required to give the speed ratios of 4 : 1, 2.5 : 1, 1.5 : 1 and 1 : 1 *approximately* in the first, second, third, and top gears respectively. The pitch of gears in module is 3.25 mm, and the centre – to – centre distance between mating gears is 7 cm. Find the suitable number of teeth on the gears, if the minimum number of teeth on the pinion is 14. [7+8]

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