Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Science and Technology Degree Programme
3rd Year 2nd Semester Examination – August/September 2014

SCT 366-2 Mechanics of Machines

Number of Questions: Four (04)
Answer all questions
Time allocation: Two (02) Hours
Mark allocation: 100 marks

1. The crank OA of a mechanism, as shown in Figure 1, rotates clockwise at 120 rpm. The lengths of various links are: OA = 100 mm ; AB = 500 mm ; AC = 100 mm and CD = 750 mm. Write expressions, using instantaneous center method for,
   a. Velocity of point C
   b. Velocity of slider D and
   c. Angular velocities of the links AB and CD.

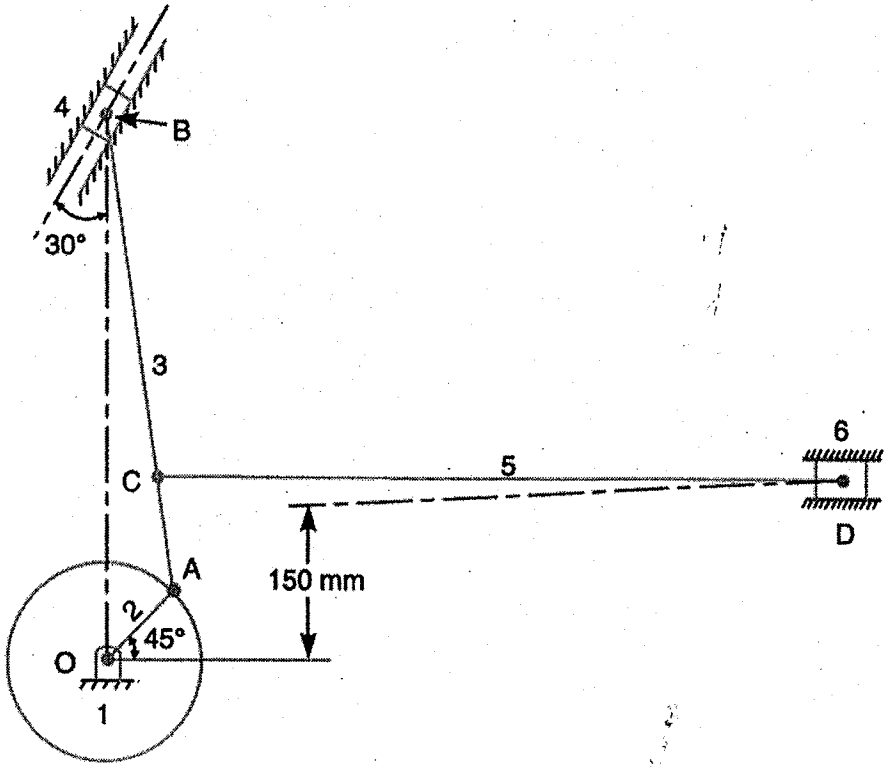

Figure 1

(25 marks)

2. Reconsider the mechanism in Figure 1.
   a. Draw the velocity diagram.
   b. Draw the acceleration diagram.

(25 marks)

3. In a turning moment diagram, the areas above and below the mean torque line taken in order are 4400, 1150, 1300 and 4550 mm^2 respectively. The scales of the turning moment diagram are:
   Turning moment, 1 mm = 100 Nm;
   Crank angle, 1 mm = 1°.
   Find the mass of the flywheel required to keep the speed between 297 and 303 rpm, if the radius of gyration is 0.525 m.

(25 marks)

4. The device shown in Figure 2 drives a chute that funnels individual beverage bottles into 12-pack containers. Pin C is rigidly attached to one link of the chain. Yoke D is rigidly welded to rod E, which extends to the chute (not shown). Carefully examine the components of the mechanism, then answer the following leading questions to gain insight into its operation.
   a. As sprocket A drives clockwise, determine the motion of sprocket B.
   b. As sprocket A drives clockwise, specify the instantaneous motion of pin C.
   c. As sprocket A drives clockwise, specify the instantaneous motion of yoke D.
   d. How far must sprocket A rotate to move pin C onto a sprocket?
   e. What happens to the motion of rod E when the pin rides onto the sprocket?
   f. What happens to rod E when pin C is on the top portion of the chain drive?
   g. Discuss the overall motion characteristics of rod E.

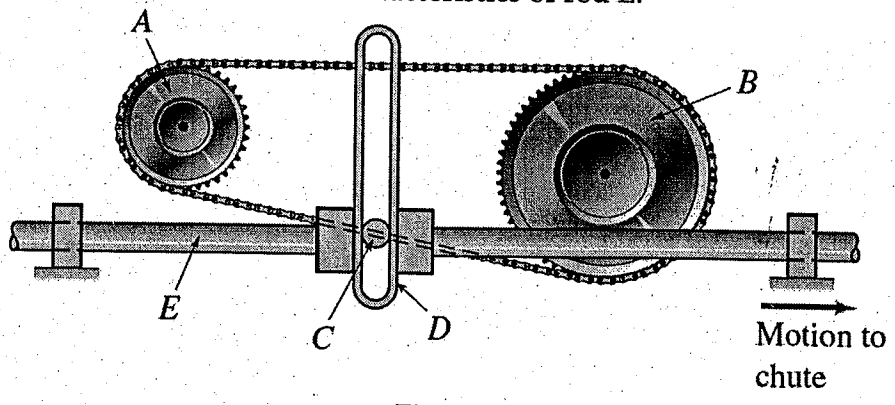

Figure 2

(25 marks)