Mansoura University | **Date: 19 / 1 / 2010**

Faculty of Engineering | **Time Allow. : 3 Hours**

Prod. Engg& Mech. Design Depart. | **Second Year , First Semester**

Final Exam. of "***THEORY OF MACHINES***"

Question: 1

20 % of full mark

Figure (1) illustrates a planetary gear train used in an industrial application. Input shafts *A* and *B* rotate at *350* and *400 rpm* (revolutions per minute) in the directions shown. **Determine :**

a) The speed and direction of rotation of output shaft *C*.

b) The magnitude (in rpm), and the direction (± sense of rotation) of angular rotation of each gear.

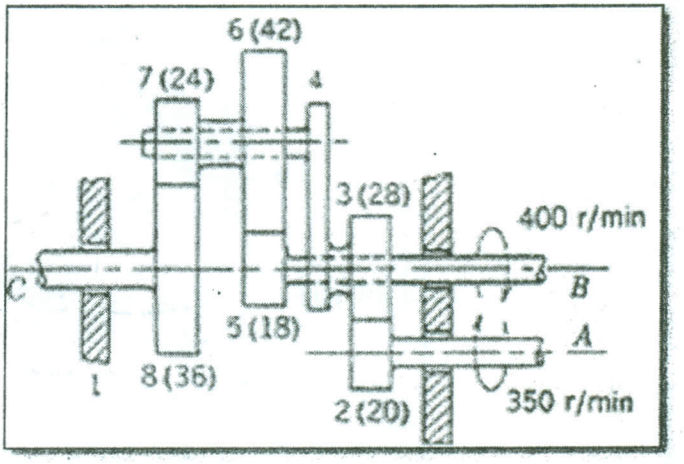

Figure (1)

Question: 2

20 % of full mark

For the static equilibrium of the mechanism of Fig. (2), ***find the required input torque.*** The dimensions are:

AB = 150 mm, BC = AD = 500 mm, DC = 300 mm,
CE = 100 mm and EF = 450mm.

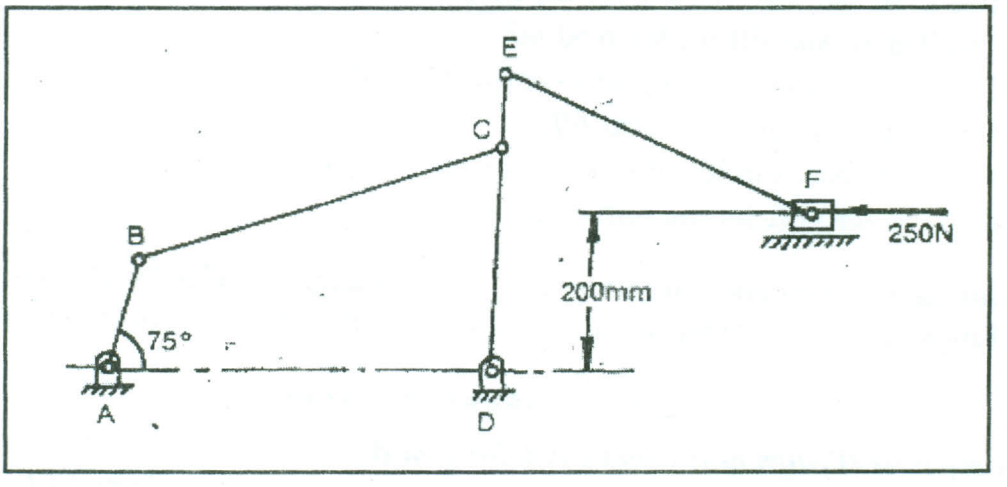

Figure (2)

Question: 3

40 % of full mark

The mechanism shown in Figure (3), is used to stamp cartons as they pass on a conveyor belt. The driver link O_2A rotates counterclockwise, with angular velocity of 3.14 rad/sec and angular acceleration of 6 rad/sec^2 .

a) Is there any Coriolis acceleration in this problem ? (Y / N)

b) Determine the angular velocities and angular accelerations of links AB, and B O_4.

c) Determine the absolute velocity and acceleration of the stamp (point X).

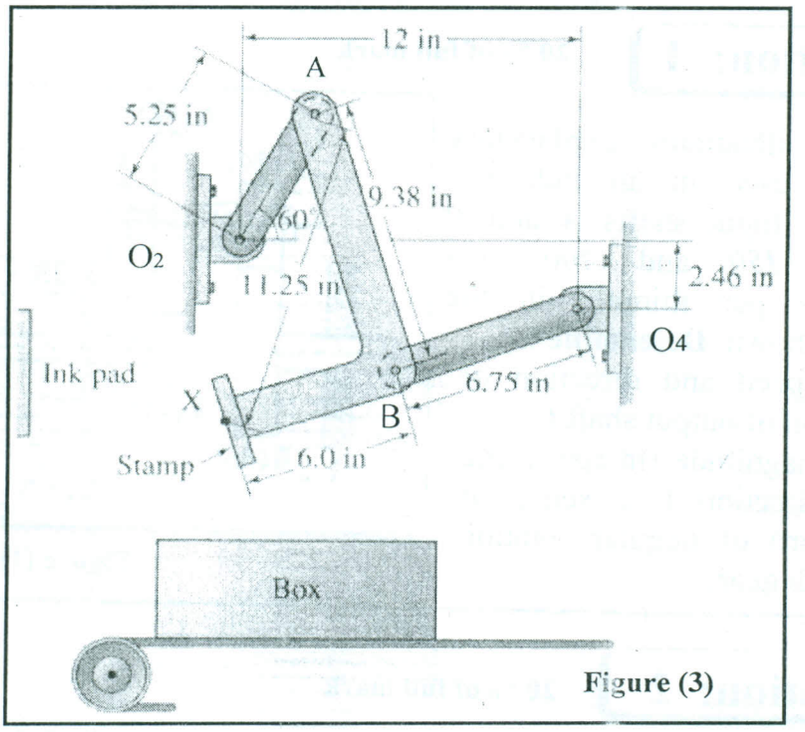

Figure (3)

Question: 4

25 % of full mark

Draw the cam profile to satisfy the following requirements:

(a) A rise from the base circle over the first 60^o of rotation to a maximum lift of *10 mm*.

(b) A dwell at *10 mm* lift for the next 60^o.

(c) A fall to *5 mm* from *10 mm* lift over the next 60^o.

(d) A dwell at *5 mm* over the next 60^o

(e) A fall to the base circle (zero lift) over the next 60^o.

(f) A dwell at zero lift for the remaining 60^o.

Assuming that the cam is rotating at a constant angular velocity of *1000 rpm*, sketch the follower displacement, as a function of cam rotation. (Specify displacement in *mm).*

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With my Best Wishes and Good Luck for you &

Dr. Samy El-Gayyar