MENOUFIA UNIVERSITY
FACULTY OF ENGINEERING
SHEBIN ELKOM
SECOND SEMESTER EXAMINATION
ACADEMIC YEAR:- 2014/2015

DEPARTMENT:PROD.ENG.&MECH.DESIGN
POST GRADUATE MASTER LEVEL 600
SUBJECT/CODE:MECHANISMS/ PRE615
TIME ALLOWED: 3 HOURS
DATE:- 8/6/2015

ANSWER THE FOLLOWING QUESTIONS :- (Total MARKS 100) (MARKS)
ASSUME ANY REQUIRED DATA.

Question No. 1 :- (25)

Data:-The mechanism shown in Fig. 1 , where

$R_3=AB=4R_2$, $R_p=AP=KR_2$, K=1,2 or 3, $T_R=1.044$, θ_3(at initial position of B)= 80.406° ,
$Y_c=Y_p$ at θ_2= 0.0, ω_2(constant)= 4 rad/s(R.H.D)

Required:- 1- Find R_2 , e and S_{tB}

2- Study the effect of K on R_4 , min. X_c and on S_{tc}

3- Derive $X_c=f(\rho_p , R_4 , \theta_2)$

4- Determine max.α (angle between R_4 and X_c direction)

5- If K=1, find θ_2 at extreme positions of C and T_d due to F_{i3} considering P is the c.g. of R_3 and θ_2= 90° .

Question No. 2 :-

Data:- A radial offset S.H. plate cam-roller follower mechanism (Fig. 2)

Required:- 1- Writting a procedure or algorithm steps to evaluate approximately $(X,Y)_{pi}$ of the cam profile at position θ_{ci}

2- Apply the previous evaluation if $R_b=4R_f$= 4/3 L = 4/1.5 e = 4 cm and $\beta_r=\beta_t=2\beta_{ud}$= 120°, ω_c(constant)= 4 rad/s (R.H.D)

- Plot $(X,Y)_{pi}$ of this cam-profile

3- Design the retainer spring if F_e= 1.5 F_w= 2 kg and compute N and F_{th}(thrust force)

4- Determine the position θ^* and max. ϕ^* during each stroke(θ^* is position of ϕ^*).

5- Find R_2 of the equivalent mechanism at θ_c= 45° and check the separation and undercutting phenomena in the cam mechanism.

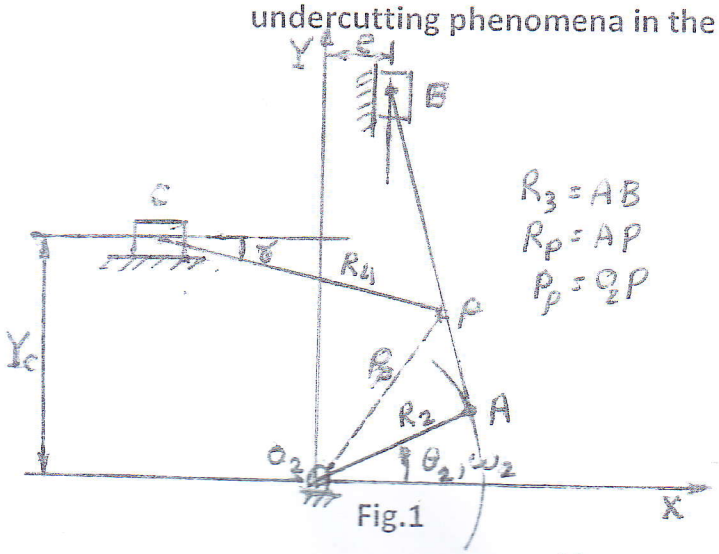

Fig.1

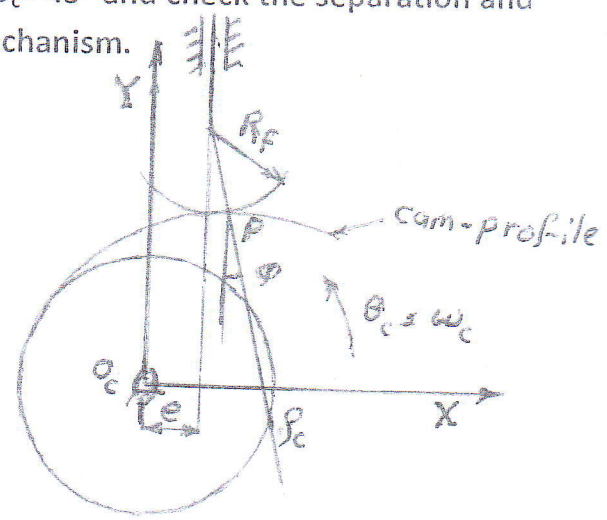

Fig.2

Please see page no. 2

Question No. 3 :- (25)

In the mechanism shown in Fig.3 , r_2=3 cm, r_3=r_5=10 cm, r_{23}=r_{34}=r_{25}=r_{56}= 6 cm, e=2cm,θ_2=30° and the crank AB rotates at constant speed of 30 rad/s (R.H.D) . Assume the inertia caused by link 2 (AB) is very small and can be neglected, while m_3=m_5=0.5 kg, m_4=m_6=0.2 kg and I_{G3}=I_{G5}= 5×10^{-3} kg.m^2, are the properties of links 3,4,5 and 6. Where G_3 and G_5 are centers of gravity of the links 3 and 5 respectively. If an external force of 20 N on slider D and with considering the effect of the inertia forces, determine the torque required at link 2 to maintain the mechanism in static equilibrium using the superposition method.

Question No. 4 :- (25)

Two masses AF and BE, Fig.4 , each weight 50 N and are pivoted at A and B to a disc which revolves about a fixed axis. The two masses are connected at E and F by a helical spring being at right angles to AB. The centers of gravity of the masses are on the line CD and each is 14 cm from the axis of rotation of the disc. A, B, E and F are all on a circle of radius 20 cm. When the disc is at rest, the two masses are pulled by the spring on the stops S. Determine:-

i) the pull in the spring so that the two masses will just float from the stops when the speed is 300 rpm.

ii) the stiffness of the spring so that the masses will revove with C and D at a radius of 16 cm when the speed is 450 rpm.

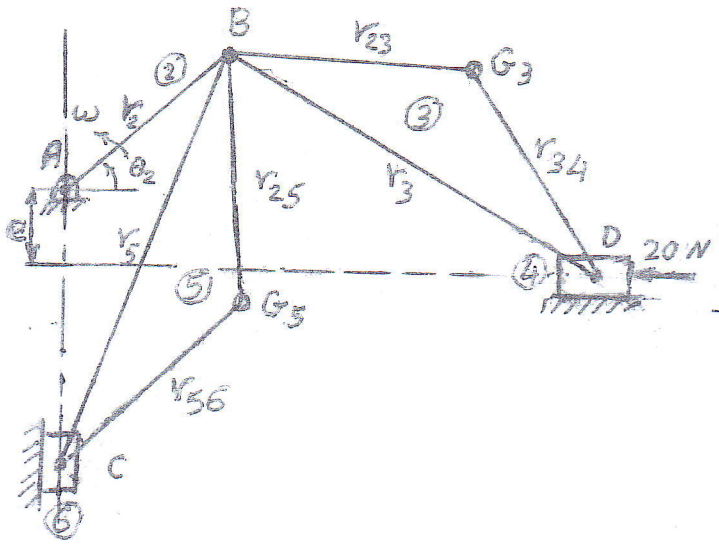

Fig. 3

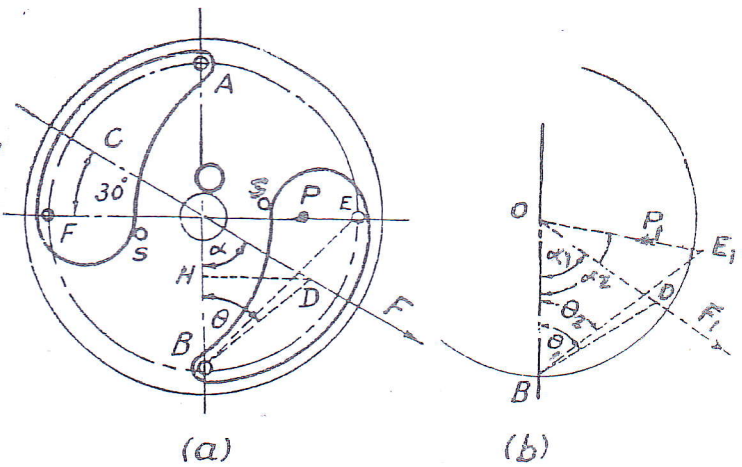

Fig.4

Pr.Dr. S. Elshakery

GOOD LUCK

With our best wishes.

Dr.R. Aouelnasr

This exam measures the following ILOs														
Question Number														
Skills														
	Knowledge &Understanding Skills					Intellectual Skills					Professional Skills			