Mansoura University
Faculty of Engineering

Prod. Eng. & M/C Design Depart.
Second Year , First Semester

Time Allow. : 3 Hours

Acad. Year : 2010/ 2011

Theory of Machines (تخلفات)

Question 1 (20 % of full mark)

The following data refer to a cam for an exhaust valve for a four stroke gas engine :

Uniform speed of disk cam	= 400 rpm, in anti-clockwise direction.
Lift	= 25 mm.
Roller diameter	= 30 mm.
The minimum radius of the cam	= 80 mm.
Out stroke with S.H.M., during	= 150° of cam rotation.
Dwell for	= 30° of cam rotation.
Return stroke with S.H.M., during	= 120° of cam rotation.
Dwell for	= the remaining 60° of cam rotation.

Draw the profile of the cam, and ***determine*** the maximum velocity and acceleration during out stroke and return stroke.

Question 2 (40 % of full mark)

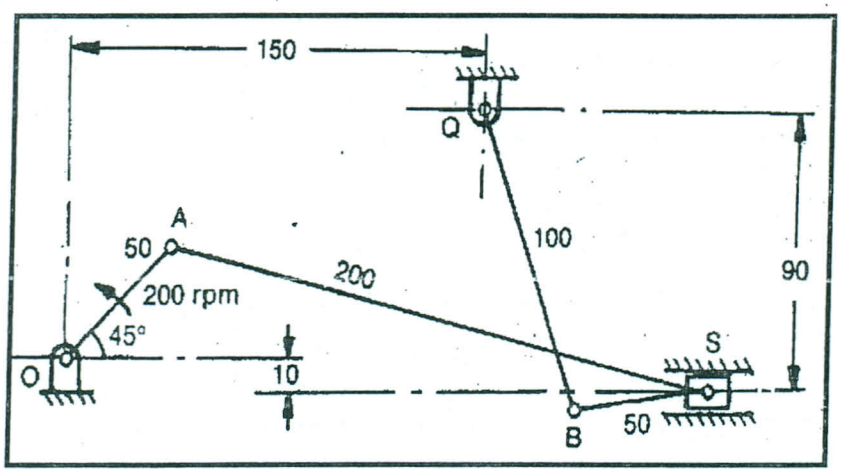

Figure (1)

Figure (1) shows a mechanism in which **O** and Q are the fixed centers. Determine the velocity and acceleration of the slider S, and the angular velocity and angular acceleration of the link BQ for the given configuration.

Question 3 (15 % of full mark)

In the planetary (epicyclic) gear train shown in figure (2), the input shaft AB drives gear G2 at 20 rpm. (c.w.) with an input torque of 100 Nm. Gear "G1" ,which has teeth cut internally, is fixed, and meshes internally with the gear "G4". Gears "G4" and "G5" are blocked together and they are free to rotate on an arm driven by the gear "G3". All gears have the same module equal to 2.5 mm., and the number of teeth of different gears are indicated in the table of Fig. (2).

Find:

The speed (in rpm.) and direction of rotation of gear "G6".

Gear No.	*No. of Teeth*
1	120
2	60
3	30
4	30
5	50
6	40

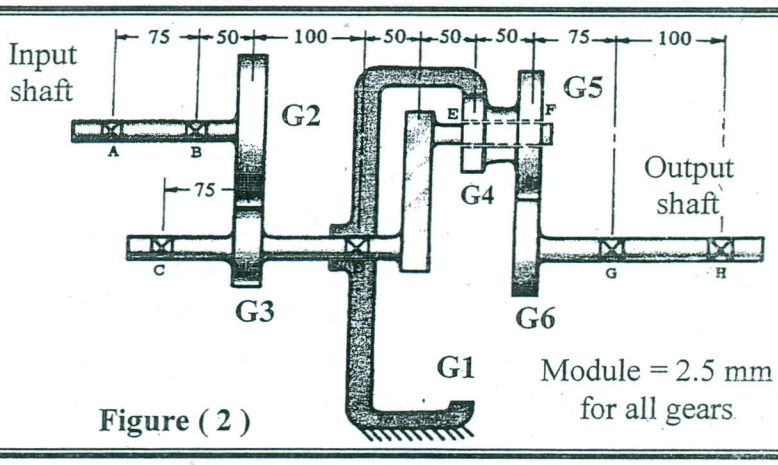

Figure (2)

Question 4 (25 % of full mark)

Four masses *A, B, C* and *D,* given in table below are to be completely balanced. The planes containing masses *B* and *C* are 300 mm apart. The angle between planes containing masses *B* and *C* is 90°. *B* and *C* make angles of 120° and 210° respectively with *D* in the same sense. Find

(a) The weight and the angular position of mass *A;*

(b) The position of planes A and D.

Mass	*Weight (N)*	*Radius (mm)*
A	**W**	**180**
B	**30**	**240**
C	**50**	**120**
D	**40**	**150**

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With my Best Wishes and Good Luck for you ....

Dr. Samy El-Gayyar