

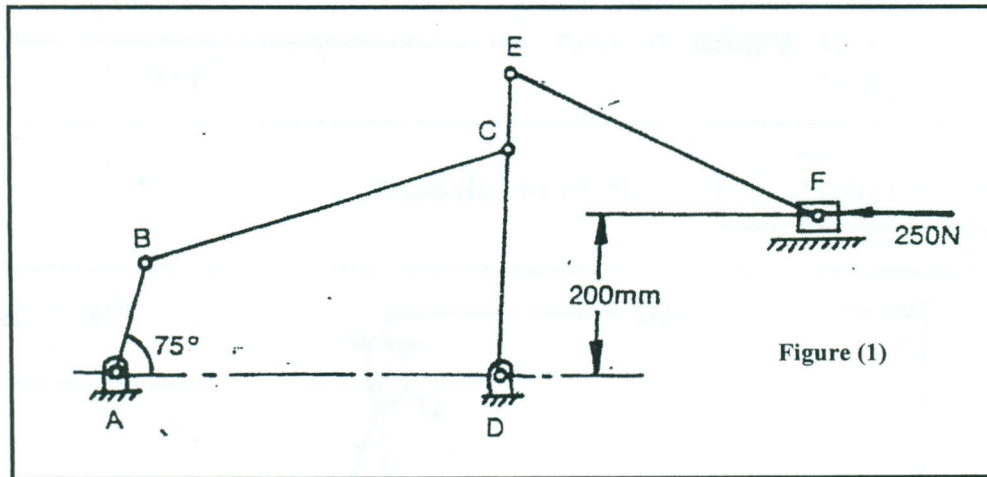
THEORY OF MACHINES

Question: 1

20 % of full mark

For the static equilibrium of the mechanism of Fig. (1), *find the required input torque*. The dimensions are:

$AB = 150 \text{ mm}$, $BC = AD = 500 \text{ mm}$, $DC = 300 \text{ mm}$,
 $CE = 100 \text{ mm}$ and $EF = 450 \text{ mm}$.



Question: 2

20 % 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 210° and 120° 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 .

Item	Mass (Kg)	Radius (mm)
A	W	180
B	30	240
C	50	120
D	40	150

Question: 3

20 % of full mark

Figure (2) 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 :**

- The speed and direction of rotation of output shaft *C*.
- The magnitude (in rpm), and the direction (\pm sense of rotation) of angular rotation of each gear.

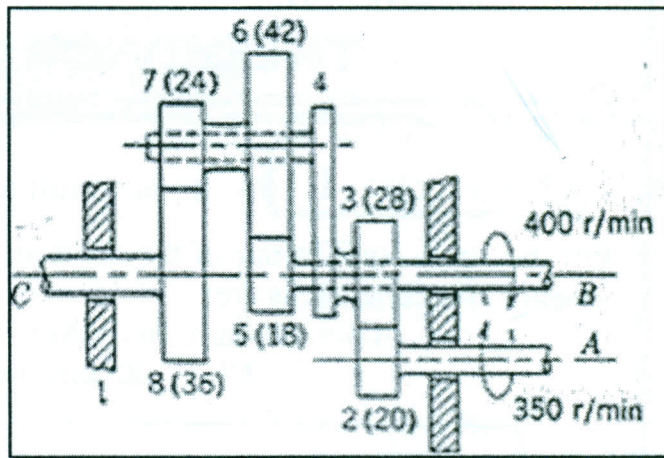


Figure (2)

Question: 3

45 % of full mark

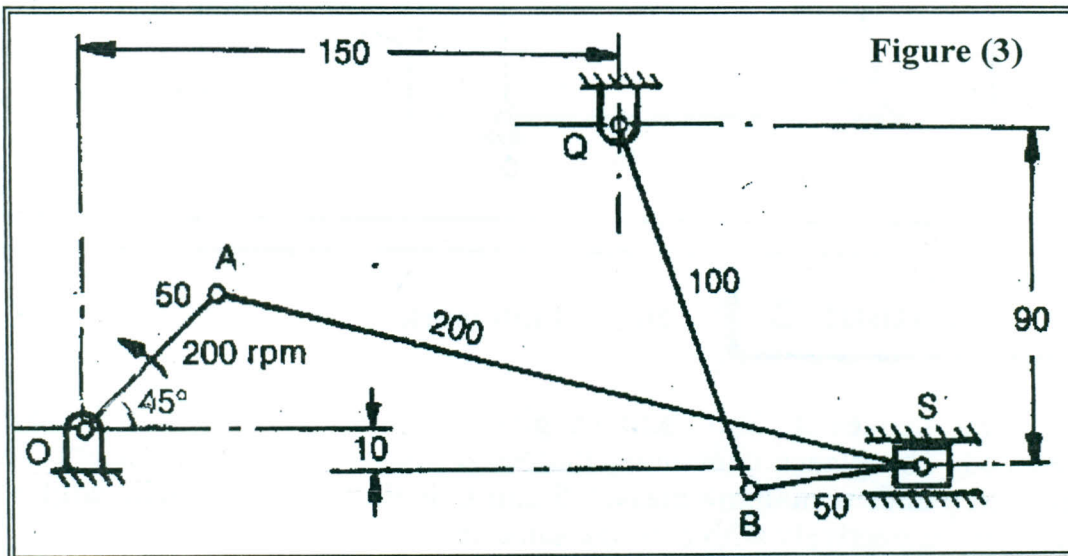


Figure (3)

Figure (3) shows a mechanism in which *O* and *Q* are the fixed centers.

For the given configuration determine:

- the velocity and acceleration of the slider *S*, and
- the angular velocity and angular acceleration of the link *BQ*

With my Best Wishes for You &

Dr. SAMY EL-GAYYAR