RN-6261

B. E. II (Sem. III) (Mech.) Examination

May / June – 2010

Theory of Machine - I

Time : **3** Hours] [Total Marks : **70**

Instruction :

(1)

नीचे दर्शावेल ☛ निशानीवाळी विगतो उत्तरवही पर अवश्य लखवी.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. 1 (Sem. 3) (Mech.)**

Name of the Subject :

☛ **Theory of Machine - 1**

☛ Subject Code No. : | **6** | **2** | **6** | **1** | ☛ Section No. (1, 2,.....) : | **1&2** |

Seat No. :

Student's Signature

(2)   Attempt all questions.

(3)   Figures to **right** indicate full marks.

(4)   Assume suitable data if required.

SECTION - I

1   (a)   Difference between (i) Machine and Mechanism   **20**
          (ii) Lower and Higher pair.

   (b)   Explain the different types of constrained motions.

   (c)   State and prove the Kennedy's theorem.

   (d)   Explain the inversions of single slider crank chain.

2   **Fig. 1** shows a sewing needle bar mechanism. The   **15**
   crank rotates at 400 rpm. The various dimensions are
   $O_1A = 16$ mm, $O_2B = 23$ mm $AB = 35$ mm
   $BC = 16$mm $\angle O_2BC = 90°$, $CD = 40$ mm.
   Locate all the I-centres find velocity of D.

Fig. 1
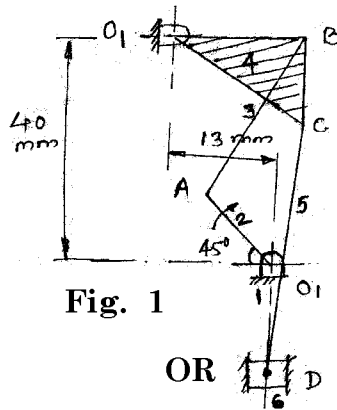
OR   (Not to scale)

2   In mechanism shown in figure-2 the dimensions are   **15**
OC=125 mm, CP = 500 mm PA = 125 mm AQ = 250 mm QE
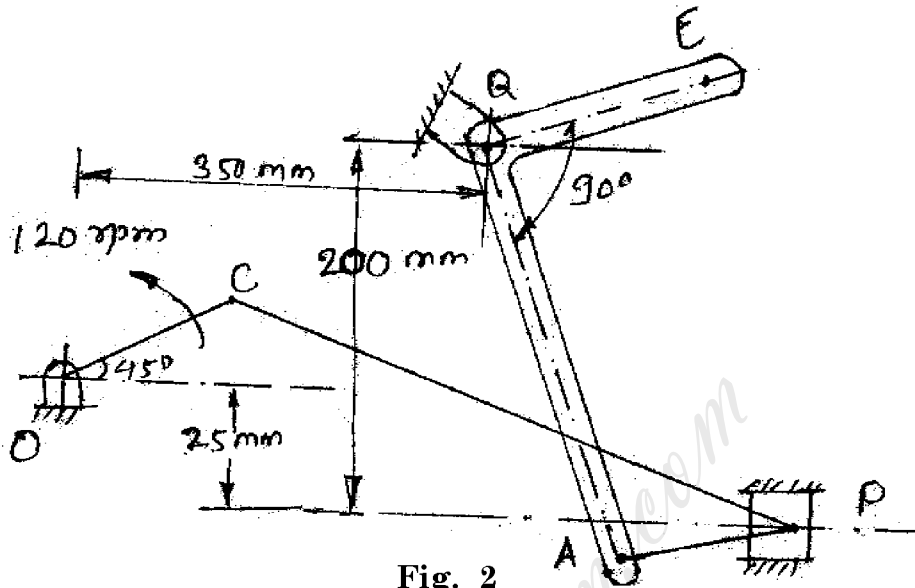= 125 mm. Draw velocity polygon and find velocity E.

Fig. 2
(Not to scale)

3   Figure 3 shows a slider crank mechanism. By polygoan   **15**
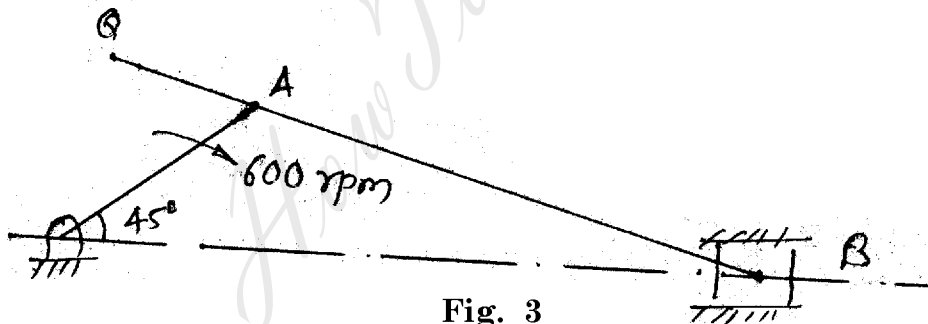method find acceleration of B&Q.
OA = 7.5 cm
AB = 30 cm
AQ = 5 cm

Fig. 3
(Not to scale)

SECTION - II

4   (a)   Attempt the following :

   (i)   What are the different types of motions with   **1**
        which a follower can move?

   (ii) Define : pitch curve.   **1**

   (iii) Gives names of metallic and non-metallic   **1**
        materials used for gear manufacturing.

   (iv) Which two types of ropes are used in rope drives?   **1**

RN-6261]   2   [Contd...

(v) What is the relation between centrifugal tension   **1**
and the maximum tension in the belt, when the
power transmitted by the belt is maximum?

(vi) The 'crowning' of the flat pulley is generally done. **1**
   (a)   To reduce belt friction.
   (b)   To prevent the belt running off the pulley.
   (c)   To increase the strength of the belt.
   (d)   To increase the power transmitted by the drive.

(vii) Explain the following terms :   **4**
   (a)   Deddendum
   (b)   Addendum
   (c)   Prime circle
   (d)   Pressure angle.

(b) The following data relate to a cam profile, in which   **8**
the follower moves with S.H.M. during the lift and
returning it with uniform acceleration and deceleration,
acceleration being half the deceleration.

Minimum radius of cam = 30 mm

Lift of the follower = 45 mm

Angle of ascent = 70°

Roller radius = 10 mm

Offset of follower axis = 12 mm toward right

Angle of descent = 120°

Angle of dwell between ascent and decent = 45°

Speed of cam = 200 rpm

   Draw the cam profile and determine maximum
velocity, maximum acceleration during lift.

5 (a) Derive the expression for centrifugal tension for   **7**
flat belt drive.

   (b) A shaft rotating at 90 rpm drives another shaft at   **8**
225 rpm and transmits 10.5 kW through a belt. The belt
is 115 mm wide and 12 mm thick and the coefficient
of friction between the belt and the pulley is 0.25. The
distance between the shaft is 2.75m and the smaller
pulley is of 600 mm diameter. Calculate the stress in
the belts if it is (i) an open belt drive (ii) cross belt drive.

<div align="center">

OR

</div>

5 (a) Derive the equation for length of belt of a cross-belt   **7**
drive.

RN-6261]   **3**   **[Contd...**

(b) The following data refer to **two** mating involute gears 8 of 20° pressure angle.

Number of teeth on pinion = 20

Gear ratio = 2

Speed of pinion in rpm = 250

Module = 10

If the addendum of each is such that the path of approach and path of recess on each side are of half the maximum possible length, find

(i) The adendum of pinion and gear

(ii) The length of path of contact

(iii) The maximum velocity of sliding during approach and recess.

6 (a) Prove that the velocity of sliding is proportional to the distance of the point of contact from the pitch point. 7

(b) A pair of spur gears with involute teeth is to give a gear ratio of 4:1. The arc of approach is not to be less than the circular pitch and smaller wheel is the driver. The angle of pressure is 14.5°. 8

Find :

(i) the least number of teeth that can be used on each wheel.

(ii) the addendum of the wheel in terms of the circular pitch.

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