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UF-6261

B. E. - II (Sem. III) (Mechanical) Examination

May / June – 2012

Theory of Machine - I

Time : Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ B. E. - 2 (SEM. 3) (MECHANICAL)

Name of the Subject :

☛ THEORY OF MACHINE - 1

☛ Subject Code No. : 6 2 6 1 ☛ Section No. (1, 2,.....) : NIL

Seat No. :

Student's Signature

(2) Attempt all questions.

(3) Figures to the right indicate full marks.

(4) Assume suitable data with justification.

1 Attempt any four : **20**

(i) Define the following :

Initial Tension

Lift of the cam

Length of path of contact

Black lash

Slip of the belt

(ii) Derive the equation of centrifugal tension $T_c = mV^2$.

(iii) For a flat belt prove

$T_1/T_2 = e^{\mu\theta}$

(iv) State and prove the law of gearing.

(v) Classification of the follower (without sketch)

(vi) Displacement, Velocity and Acceleration diagram when the follower moves with SHM - Sketch only.

2 Attempt any two : **30**

(i) Draw the cam profile for operating the valve of engine. It is required to give equal uniform acceleration and retardation during opening and closing of the valve each of which corresponds to 60^o of cam rotation. The valve must remain in fully open position for 20^o of cam rotation.

The lift of the valve is 37.5 mm and the least radius of cam is 40 mm. The follower is provided with a roller of radius 20 mm and line of stroke passes through the axis of the cam. Position of cam angle is [60^o-20^o-60^o and other).

(ii) An open flat belt drive connects two parallel shaft 1.2 meter apart. The driving and driven shaft rotates at 350 rpm and 140 rpm respectively and driven pulley is 400 mm in dia. The belt is 5mm thick and 80 mm wide μ=0.3 and σ = 1.4 MN/m^2.

Determine :

(i) Dia. of driving pulley

(ii) Max. power by belting

(iii) Initial tension

(iii) Two mating gears have 20 & 40 involute teeth of module 10 mm and 20^o pressure angle. The addendum on each wheel is to be made of such a length that the line of contact on each side of the pitch point has half the max. possible length. Determine the addendum height for each gear wheel and contact ratio.

3 Answer the following questions : **10**

(i) Distinguish between mechanism and machine.

(ii) Explain sliding pair and turning pair with suitable example.

(iii) Differentiate lower and higher pair.

(iv) What is velocity of rubbing ? How is it found ?

(v) What is instantaneous centre of rotation ? How do you know number of 1 centers in mechanism ?

4 (i) In slider crack mechanism, the crank is 480 mm long and rotates at 20 rad/sec in the counter clockwise direction. The length of the connecting rod is 1.6 m. When the crank turns 60 degree from the inner dead centre, determine the **20**

(a) Velocity of the slider

(b) Velocity of a point E located at a distance 450 mm on the connecting rod extended.

(c) Angular velocity of connecting rod

(d) velocities of rubbing at the pins of the crankshaft, crank and the cross head having diameters 80, 60 and 100 mm respectively.

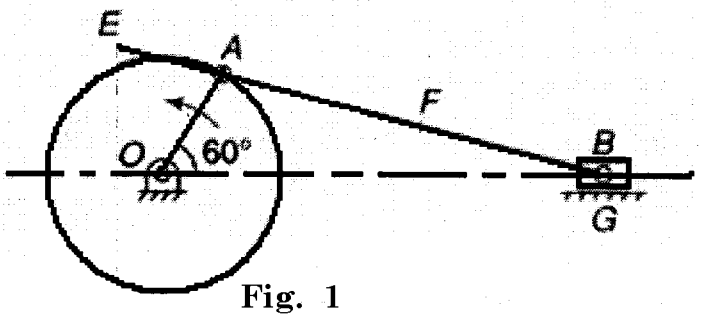
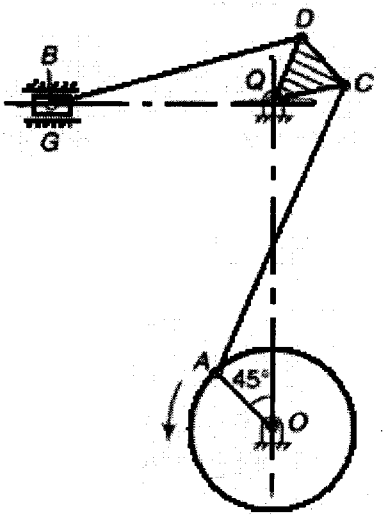


Fig. 1

OR

(ii) The lengths of various links of a mechanism shown in fig. 2 are as follows : **20**

OA = 150 mm; CD = 125 mm; AC = 600 mm; BD = 500 mm; CQ = QD = 145 mm; OQ = 625 mm. The crank rotates at 60 rpm in the CCW direction. Determine the velocity of the slider B and the angular velocity of the link BD when the crank has turned an angle of 45° with the vertical.

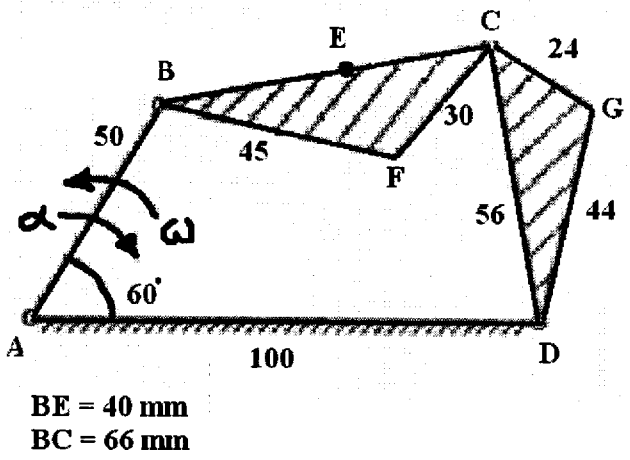


(Fig2)

5 Figure shows the configuration diagram of a four link mechanism along with the length of the link in mm. The link AB has an instantaneous angular velocity of 10.5 rad/sec and a retardation of 26 rad/sec^2 in CCW direction. Find **20**

(i) The angular acceleration of the link BC and CD

(ii) The linear acceleration of the point E, F and G (all dimensions are in mm)



BE = 40 mm
BC = 66 mm

(Fig 3)