Total No. of Printed Pages:3

SUBJECT CODE NO:- H-168
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mech/Prod)
Theory of Machines - I
(REVISED)

[Time: Three Hours]   **[Max.Marks:80]**

Please check whether you have got the right question paper.

N.B   1. Q.No.1 and Q.No.6 are compulsory.
          2. Attempt any two questions out of remaining from each section.
          3. Figures to the right indicate full marks.
          4. Draw neat sketches wherever necessary.
   5. Assume suitable data wherever necessary.

Section A

Q.1   Attempt any five: 10
          a) Define Rubbing Velocity.
          b) Define higher pair & Lower pair.
          c) Write classification of kinematic pair.
          d) Degrees of freedom.
          e) Define Kutzbatch criterion.
          f) Define Space centrode & body centrode.
          g) State Kennedy theorem.
          h) What is Coriolis component of acceleration
          i) What is successfully constrained Motion?
          j) Define Radial component of acceleration.

Q.2   Length of various links of a mechanism as shown in fig. OA = 0.3m, AB =1m, CD = 0.8m, and   15
          AC = CB. Crank OA rotates at 60 rpm. Find.
          1) Velocity of slider D and angular velocity of link CD. Use I-Centre Method.

1
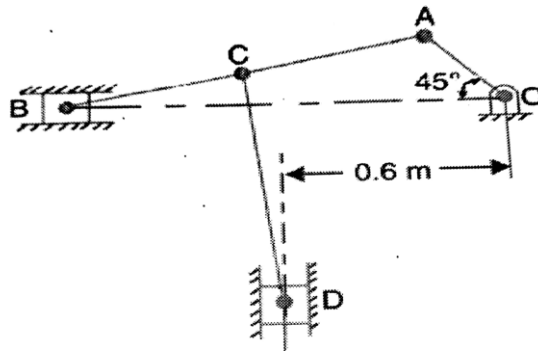
Q.3   The mechanism, as shown in fig. has the dimensions of various links as follows: 15
       $AB = DE = 150\ mm; BC = CD = 450mm,; EF = 375\ mm$. The crank AB makes an angle of
       45° with the horizontal and rotates about A in the clockwise direction at a uniform speed of 120
       r.p.m. determine:
       1. Velocity of the block F,
       2. Angular velocity of DC, and
       3. Rubbing speed at the pin C which is 50 mm in diameter.
   Use relative velocity method.
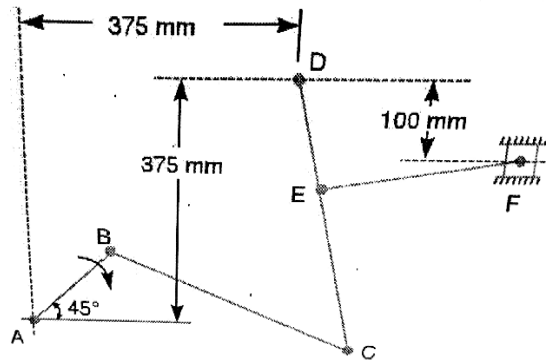
Q.4   a) In an reciprocating engine mechanism crank length is 250mm, connecting rod length is 950   10
               mm. crank rotates at 200 r.p.m clockwise which makes an angle 45° with IDC. Find
               1) Velocity and acceleration of piston
               2) Angular velocity and angular acceleration of connecting rod.
               (Use Klein's Construction Method)

           b) Explain with neat sketch working of whit worth quick return mechanism.   05

Q.5   Fig. shows a mechanism in which the crank OA, 100 mm long rotates clockwise about O at 130   15
       r.p.m. the connecting rod AB is 400 mm long. The rod CE, 350 mm long, is attached to AB at C,
       150 mm from A. this rod slides in a slot in a trunnion at D. the end E is connected by a link EF, 300
       mm long, to the horizontally moving slider F.
       1) Find velocity of slider F.
       2) Acceleration of slider F.
       3) Angular acceleration of EF.

2
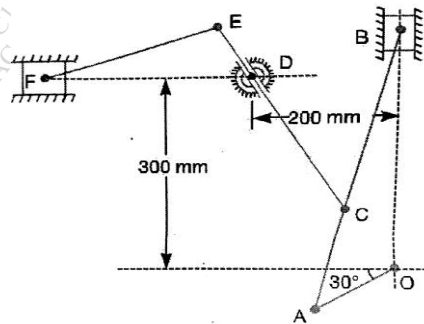
Section B

Q.6   Attempt any five: 10
   a) Define Necessity of balancing.
   b) Difference between dynamometer and brake.
   c) Explain Inside cylinder locomotive.
   d) Define Pressure angle.
   e) Define Self Energizing.
   f) Define Centrifugal force and its formula.
   g) Define Blow Hammer.
   h) Define Swaying Couple.
   i) Define transmissions dynamometer.
   j) Write classification of brake.

Q.7   A cam is to be designed for a knife edge follower with following data: cam lift = 40mm during 90°   15
   rotation of cam rotation with uniform velocity. Dwell for next 30°. During next 120° of cam
   rotation, the follower returns to its original position with SHM. Draw the profile of the cam when
   the line of stroke of the follower passes through the center of cam shaft. The radius of the cam is
   40mm.

Q.8   a) Explain with neat sketch rope brake dynamometer.   03

   b) A band brake acts on the 3/4th of circumference of a drum of 460 mm diameter which is   12
   keyed to the shaft. The band brake provides a braking torque of 250 N-m. one end of the
   band is attached to a fulcrum pin of the lever and the other end to a pin 100 mm from the
   fulcrum. If the operating force is applied at 510 mm from the fulcrum and the coefficient of
   friction is 0.25, find the operating force when the drum rotates in the
   a) Anticlockwise direction, and
   b) Clockwise direction.

Q.9   Four masses A, B, C and D revolve at equal radii and are equally spaced along a shaft. The mass B   15
   is 7kg and radii of C & D makes an angle 90° & 240° respectively with the radius of B. find
   magnitude of masses A, C, D and the angular position of A so that system is to be in completely
   balanced.

Q.10   An inside cylinder locomotive has its cylinder center lines 0.7 m apart and has a stroke of 0.6 m.   15
   the rotating masses per cylinder are equivalent to 140 kg at the crank pin, and the reciprocating
   masses per cylinder to 170 kg. The wheel center lines are 1.5 m apart. The cranks are at right angles.
   The whole of the rotating and 2/3of the reciprocating masses are to be balanced by masses placed at
   a radius of 0.5 m. find the magnitude and direction of the balancing masses. Find magnitude of
   hammer blow, variation of tractive effort the magnitude of swaying couple at a crank speed of 250
   r.p.m.