SE/Sem IV/CBCGS/AUTO/MJ 2019/29-05-2019

Time: 3 Hrs **[Total Marks 80]**

N.B.:
(1) **Question No.1 is compulsory**
(2) Attempt any **three** questions out of remaining **five** questions
(3) Figures to right indicate full marks
(4) Assume suitable data if **necessary**.
(5) Notations carry usual meaning.

Q.1 **Attempt any four** 20
  A. State and prove Kennedy's Theorem
  B. Define i) Kinematic link ii) Kinematic pair iii) Kinematic chain.
  C. Classify follower in details.
  D. Explain self energizing and self locking brake.
  E. Explain the terms slip and creep in belts.
  F. State i) Work energy principle ii) D'Alemberts principle

Q.2A. The mechanism, as shown in Fig. 1, the slider D is constrained to move on a horizontal 12
    path. The crank OA is rotating in the counter-clockwise direction at a speed of 180
    r.p.m. The dimensions of various links are as follows : OA = 180 mm ; CB = 240 mm ;
    AB = 360 mm ; and BD = 540 mm. For the given configuration, find : 1.Velocity of
    slider D, 2. Angular velocity of links AB, CB and BD
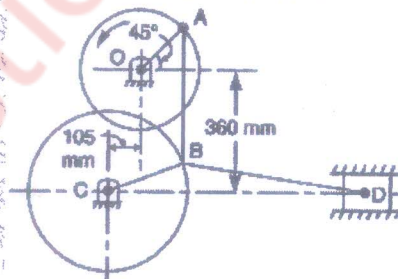   1. By instantaneous centre method
    2. By relative velocity method

Figure No.1

  B. An open belt drive transmit power from a 300 mm diameter pulley running at 240 rpm 08
    to a pulley 450 mm diameter. Angle of lap on smaller pulley is 165^0. The belt is on the
    point of slipping when 3KW is being transmitted. The coefficient of friction is 0.3.
    Determine effect on power transmission in following cases.
    i) Initial tension in the belt increased by 10%
    ii) Suitable dressing is given to the belt surface to increase the coefficient of friction by
    10%. Assume that initial tension is kept same.

C6948EF61F21F6B48B0080F3BE37C069

Q.3A. Two 20^0 involute spur gear have a module of 10mm. The addendum is one module. The larger has 50 teeth and the pinion has 13 teeth. Does interference occur? If it occur, to what value the pressure angle be changed to eliminate interference. 10

B. Differentiate between involute and cycloidal gear tooth profile. 04

C. In a crank and slotted lever quick return mechanism the distance between the fixed 06 centres is 350 mm and length of driving crank is 150 mm. Find the inclination of slotted lever with vertical in the extreme position and ratio of time of cutting stroke to return stroke.

Q.4 A. A mechanism of a crank and slotted lever quick return motion is shown in Figure 2. If 14 the crank rotates counter clockwise at 120 r.p.m., determine for the configuration shown, the velocity and acceleration of the ram D. Also determine the angular acceleration of the slotted lever. Crank, AB = 150 mm , Slotted arm, QC = 700 mm and link CD = 200 mm.
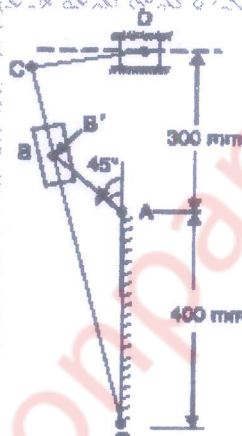

Figure No .2

B. Draw a neat sketch of Tchebicheff mechanism & prove that the length of link must be 06 in a ratio of 1:2:2.5.

Q.5A. In an epicyclic gear train an annular wheel A having 54 teeth meshes with a planet 08 wheel B which gears with a sun wheel C, the wheel A and C being co-axial. The wheel B is carried on a pin fixed on one end of arm P which rotates at 100 rpm about the axis of the wheel A and C. If the wheel A makes 20 rpm in clockwise sense and the arm rotates at 100 rpm in anti clockwise direction and C has 24 teeth, Sketch the arrangement and determine rpm and sense of rotation of wheel C

B. A cord wrapped around a solid cylinder of radius 'r' and mass 'm'. The cylinder is 06 released from rest. Determine the velocity of its centre of mass after it has moved down a distance 'h'.

C. Two shafts are connected by Hooke's joint. The driving shafts rotates at a uniform 06 speed of 1000 rpm. The angle between the shafts is 20^0. Calculate the maximum and minimum speed of driven shafts, when acceleration of the driven shaft is maximum.

Q.6A. The centre to cemtre distance between the two sprocket of a chain drive is 600mm. The chain drive is used to reduce speed from 180 rpm to 90 rpm on driving sprocket has 18 teeth and a pitch circle diameter of 480 mm determine i) Number of teeth on drven sprocket ii) Pitch and length of chain   08

B. A cam is rotating at 200 rpm operate a reciprocating roller follower of radius 2.5 cm. The least radius of cam is 30mm , stroke of follower is 5cm. Ascent takes place by uniform acclereation and deceleration and descent by simple harmonic motion. Ascent take place by 70^0 and descent during 50^0 of cam rotation. Dwell between ascent and descent 60^0. Sketch displacement, velocity, acceleration and jerk diagram.   12

****

C6948EF61F21F6B48B0080F3BE37C069