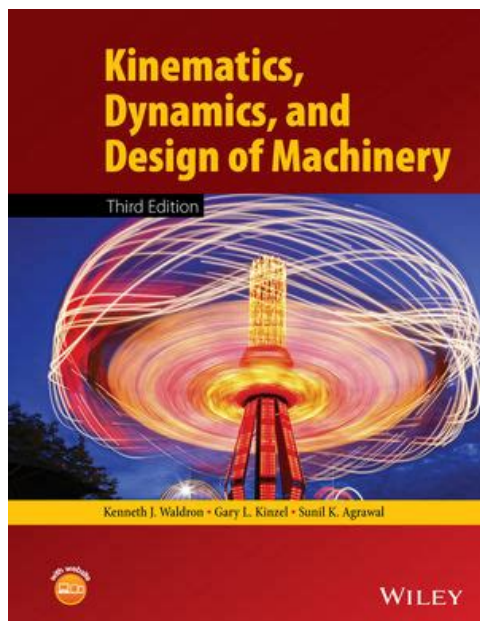




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He taught courses in machine design, kinematics, stress analysis and form synthesis and received ten research and teaching awards, including the OSU Alumni Teaching Award, the ASME Ruth and Joel Spira Outstanding Design Educator Award, and the ASEE Ralph Coates Roe Award. Sunil Agrawal has authored more than 175 archival journal papers, 225 refereed conference papers, 2 books, and 13 US patents. Currently, there are 10 PhD students working under his guidance. Discover everything Scribd has to offer, including books and audiobooks from major publishers. Start Free Trial Cancel anytime. Browse Books Site Directory Site Language English Change Language English Change Language. No need to wait for office hours or assignments to be graded to find out where you took a wrong turn. Design Of Machinery 4th Edition Pdf Free 76 Machine Design A n Integrated Approach 4th edition by Robert 10 May 2011. Machine Design Norton Solution Manual 4th measurements fourth 4th ed solutions manual free pdf ebook 4th edition figliola machine elements. Norton Machine Design 4th Edition Solution Manual. Design of Machinery, An Introduction to Synthesis and. eBook free PDF download on. Design of Machinery An Introduction to the Synthesis and. He has extensive industrial experience in engineering design and manufacturing and many years' experience teaching mechanical engineering, engineering. Machine Design An Integrated Approach 5th edition. Buy Machine Design An Integrated Approach 5th edition 9780133356717 by

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Using a coordinate frame attached to earth, or an inertial coordinate frame, a submarine has 6 DOF. 3 linear. If the satellite was just a particle it would have 3 DOF. But, since it probably needs to be oriented with. There is no difference between a submerged submarine and a surface ship, both have 6 DOF. One might. A ship's position is generally given by two coordinates longitude and. Thus, for all practical. At an intersection, the motorcycles position is given by two coordinates. In addition, it will have some. Thus, there are 4 DOF. A two button mouse has 4 DOF. It can move in the x and y directions and each button has 1 DOF. The joy stick has 2 DOF x and y and orientation, for a total of 3 DOF. DESIGN OF MACHINERY 5th Ed. Solution See Mathcad file P0205. They are force closed by ligaments that hold them together. None are geometrically closed. DESIGN OF MACHINERY 5th Ed. Diseno de maquinas en ingles Norton segunda edicion. Machine Design, 5e presents the subject matter in an up. Share; Like; Download. 9789701068847 Traducido de la cuarta edicion de Design of machinery An Introduction to the Synthesis and Analysis of Mechanisms and Machines.. En el DVD se proporciona todo el Atlas Hrones y Nelson de curvas de acoplamiento como archivos PDF. Scribd is the worlds largest social reading and publishing site. If searched for the ebook Solution manual machine design 4th edition norton in pdf format, in that case you come on to the correct site. Unlike static PDF Design Of Machinery With Student Resource DVD 5th Edition solution manuals or printed answer keys, our experts show you how to solve each problem stepbystep. Design of Machinery Solutions Manual Norton 5th Edition 1.pdf. Author Ricardo Alves Felipe. 43 downloads 402 Views 14MB Size. Report. DOWNLOAD.PDF.. 4 DESIGN OF MACHINERY 5th Ed. Scribd is the worlds largest social reading and publishing site. Search Search. Close suggestions. Upload. Sign In.. MachineDesign3ENortonSolutions.

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<http://www.e-lysis.com/images/Ct100-Manual-Behringer.pdf>

Given Position 1 offsets x_{A1B1} 1.721 in y_{A1B1} 1.750 in. Solution See figure below for one possible solution. Input file P0304.mcd from the solutions manual disk A2 and B1 to B2. In the solution below In the solution below the distances. O4A and O6B were each selected to be 4.000 in. This resulted in a ground link length O4O6 for the fourbar of Link 5 coupler L5 x_{A1B1} Link 4 input L4 4.000 in Link 6 output L6 4.000 in. Ground link 1b L1b 6.457 in In the solution below the distance CD was selected to be 4.000 in. In the solution below the radius was measured as 0.6895 in. Link 2 crank L2 0.6895 in Link 3 coupler L3 4.000 in. Link 4a rocker L4a 2.000 in Link 1a ground L1a 4.418 in Shortest link S L2 S 0.6895 in Longest link L L1a L 4.4180 in Other links P L3 P 4.0000 in Q L4a Q 2.0000 in $L \cdot \max \cdot a \cdot b \cdot c \cdot d$ Solution See Figure P32 and Mathcad file P0305. Design choices. Length of link 5 L5 4.250 Length of link 4b L4b 1.375 Label their Label the intersection O4. The fourbar is now defined as O2CDO4 Ground link 1a L1a 0.718 Link 2 L2 2.197. Link 3 L3 2.496 Link 4 L4 3.704 Note that any Grashof condition is potentially acceptable in this case. $L \cdot \max \cdot a \cdot b \cdot c \cdot d$ B was selected to be L4b 1.375. Label the other end A. Link 6 crank L6 1.230 Link 5 coupler L5 4.250 Link 1b ground L1b 4.328. Link 4b rocker L4b 1.375 Build a cardboard model and determine the toggle positions and the Add a driver dyad. Solution See Figure P32 and Mathcad file P0306. Length of link 5 L5 5.000 Length of link 2b L2b 2.000 C2O2D2. This defines the relationship of the fixed pivot O2 to the coupler line CD in the second coupler C2O4D2. This defines the relationship of the fixed pivot O4 to the coupler line CD in the second coupler Label their Label the intersection H. The fourbar is now defined as O2GHO4 Ground link 1a L1a 4.303 Link 2 L2 8.597. Link 3 L3 1.711 Link 4 L4 7.921 Note that any Grashof condition is potentially acceptable in this case. Condition $a \cdot b \cdot c \cdot d \cdot S \cdot \min \cdot a \cdot b \cdot c \cdot d \cdot L \cdot \max \cdot a \cdot b \cdot c \cdot d$ B was selected to be L2b 2.000.

<https://datavoiz.com/images/Ct110-Manual-Clutch.pdf>

Label the other end A. Link 6 crank L6 0.412 Link 5 coupler L5 5.000 Link 1b ground L1b 5.369. Link 2b rocker L2b 2.000 Given Time ratio Tr Also see Mathcad file P0307. Tr In the solution below, each

line makes an angle of 45 deg with theIn the solution below, the line is 30 deg toThe intersection of these two lines establishes the point O2.Extend O2B2 to meet this arc. Erect a perpendicular bisector toGround link 1 d 3.0119 in. Crank 2 a 1.0353 in. Coupler 3 b 3.8637 in. Rocker 4 c 2.000 inGiven Time ratio TrAlso see Mathcad file P0308.TrIn the solution below, the length of O2A isLabel the intersections C1 and C2. In the solution below, the length of AC isBisect it to locate the fixed pivot O4.Line O4C is the driven crank, link 4. In the solution below, O4CIf nonGrashoff, repeat steps 7 through 11 with a shorter radius in step 7. L max a b c d O4C link 4. The pivot point O6 will lie on the perpendicular bisector of B1B2 at a distance from XX whichIn the solution below, theGiven Time ratio TRDesign choices. Length of link 2 crank L2 1.000 Length of stroke S 4.000. Length of link 5 coupler L5 5.000These two lines willUsing point B1 as center, drawGiven Link lengths Coupler point data. Ground link L1 2 Crank L2 1 A1P 1.800 34.000 deg. Coupler L3 3 Rocker L4 3.5 B1P 1.813 33.727 deg. Solution See Figure 317 and Mathcad file P0310.Point P has the same pathCrank length L2 1.000 L10 1.800 L7 0.604 Coupler length L3 3.000 L9 0.600 L6 2.115 Rocker length L4 3.500 L8 2.100 L5 1.813 Coupler point A1P 1.800 A2P 1.000 A3P 2.100 Coupler angle 34.000 deg 34.000 deg 247.727 degFOURBAR and letting it calculate the cognates.Given Link lengths Coupler point data. Ground link L1 39.5 Crank L2 15.5 A1P 26.0 63.000 deg. Coupler L3 14.0 Rocker L4 20.0. Solution See Figure 325a and Mathcad file P0311.Note that theCrank length L2 15.500 L10 26.000 L7 25.763 Coupler length L3 14.000 L9 28.786 L6 33.243Coupler point A1P 26.000 A2P 15.500 A3P 20.000 Coupler angle 63.000 deg 63.000 deg 84.

584 degThey are OAA2PA3OB, OAA1PB3OC, and. OBB1PB2OC. They are shown individually below with their associated gears.Crank length L10 26.000 L2 15.500 L4 20.000 Coupler length A2P 15.500 A1P 26.000 L5 23.270 Rocker length A3P 20.000 L8 37.143 L7 25.763 Crank length L5 23.270 L7 25.763 L8 37.143 Coupler point A2P 15.500 A1P 26.000 B1P 23.270 Coupler angle 0.00 deg 0.00 deg 0.00 degGiven Crank dwell period 90 deg. Output rocker motion 45 deg. Solution See Figures 320, 321, and Mathcad file P0312. Coupler angle, 72 deg. Crank length, L2 2.000Coupler link 3 length L3 CLR L2 L3 5.000 Rocker link 4 length L4 CLR L2 L4 5.000 Ground link 1 length L1 GLR L2 L1 4.000 Angle PAB Length AP on coupler AP 2 L3.Angle Coupler Pt Coupler Pt Coupler Pt Coupler Pt. Step X Y Mag Ang. DegFind the center of the pseudoarcThe center willEstablish this point and label it E. FOURBAR for Windows File P0312.DAT. Angle Coupler Pt Coupler Pt Coupler Pt Coupler Pt. DegConstruct a perpendicular bisector of the line segment DE andLocate fixed pivot O6 on the bisector of DE suchDraw link 6 from DThis is the output link that will dwell during theSee next page for the completed layout and further linkage specifications.Ground link L1 4.000 Crank L2 2.000 Coupler L3 5.000 Rocker L4 5.000 Coupler point AP 5.878 54.000 deg Added dyad. Coupler L5 6.363. Output L6 2.855. Pivot O6 x 3.833 y 3.375Given Initial crank dwell period 90 deg. Final crank dwell period 60 deg approx.. Output rocker motion between dwells 60 deg. Solution See Mathcad file P0313. Ground link length L1 5.000 Crank length L2 2.000. Coupler link length L3 5.000 Rocker length L2 5.500. Coupler point data AP 8.750 50 degThen, using program. FOURBAR and by trialanderror, adjust the link lengths and coupler point data until a satisfactoryThe link lengths and coupler point data given above were found this way. TheFOURBAR is also printed below.Angle Cpler Pt Cpler Pt Cpler Pt Cpler Pt. DegFit tangentLabel their intersection O6.

The coordinates of O6 are 6.729,Provide a slot in link 6 to accommodate sliderDetermine its minimum transmissionWill it work If so, explain how it does. Given Link lengths Link 2 L2 0.60 m Link 3 L3 0.75 m. Link 4 L4 0.13 m Link 1 L1 0.90 m. Grashof condition function. L max a b c d Table 24. Barker classification Class I4, Grashof rockerrockercrank, GRRC, since the shortest linkThat is, oneThe reason is that the grinding wheel willTypically, the operator will start the motion by rotating the wheel by hand.All dimensionsGiven Link lengths. Link 1 ground L1 95 mm Link 2 driver L2 50 mm. Link 3 coupler L3 44 mm Link 4 driven L4 50 mm. Solution See Figure P34 and Mathcad file P0315.Solving for 2,The other toggle position occurs at 73.558 degAngle Theta2 Theta3 Theta4 Trans Ang. Step Mag Mag Mag Mag. Deg degrees degrees degrees degreesFrom it, we see

that the maximum transmission angle is Grashof or non-Grashof. Given Link lengths Coupler point data. Ground link L1 9.5 Crank L2 5 A1P 8.90 56.000 deg. Coupler L3 4.4 Rocker L4 5. Solution See Figure P34 and Mathcad file P0316. Note that the Crank length L2 5.000 L10 8.900 L7 8.410 Coupler length L3 4.400 L9 10.114 L6 8.410 Coupler point A1P 8.900 A2P 5.000 A3P 5.000 Coupler angle 56.000 deg 56.000 deg 94.470 deg Condition a b c d S min a b c d L max a b c d Given Link lengths Coupler point data. Solution See Figure P34 and Mathcad file P0317. Note that the Crank length L2 5.000 L10 8.900 L7 8.410 Coupler angle 56.000 deg 56.000 deg 94.470 deg However, following The free end of The result is a Watt I sixbar with links numbered 1, 2, 3, 4, 6, and 8 Given Link lengths Coupler point data. Solution See Figure P34 and Mathcad file P0318. Note that the Crank length L2 5.000 L10 8.900 L7 8.410 Watt I sixbar with links numbered 1, 2, 3, 4, 6, and 8 Arrange the fixed pivots Given Length of straight line motion of the forks x 1800 mm. Solution See Figure P35 and Mathcad file P0319.

Use a Hoekentype straight line mechanism optimized for straightness. Maximum allowable error in straightness of line Cy 0.096 % Link ratios from Table 31 for $L_1 \text{ over } L_2$ 2.200 $L_3 \text{ over } L_2$ 2.800 $x \text{ over } L_2$ 4.181. Link lengths. Crank L2 Coupler L3 $L_3 \text{ over } L_2$ L2 L3 1205.5 mm Ground link L1 $L_1 \text{ over } L_2$ L2 L1 947.1 mm Rocker L4 L3 L4 1205.5 mm Coupler point BP L3 BP 1205.5 mm Cy 2 L3 2 Keep the fixed pivots as close to the existing frame as Given Dimensions scaled from Figure P36. Rocker arm link 4 distance between pin centers L4 320 mm. Solution See Figure P36 and Mathcad file P0320. Design choices Example 32. In this solution it was extended horizontally This will allow L max a b c d Note the duplicate crank and coupler Using the same fourbar driving stage links 1, 2, 3, 4 with Given Link lengths Coupler point data. Ground link L1 2.22 Crank L2 1 A1P 3.06 31.000 deg. Coupler L3 2.06 Rocker L4 2.33. Solution See Figure P37 and Mathcad file P0321. Note that the Coupler length L3 2.060 L9 1.485 L6 1.893 Rocker length L4 2.330 L8 3.461 L5 1.674 Coupler point A1P 3.060 A2P 1.000 A3P 3.461 Coupler angle 31.000 deg 31.000 deg 39.344 deg Condition a b c d S min a b c d L max a b c d Without allowing links 5, 6, and 7 to rotate, slide them as an assembly along lines OAOC and qq until the The free end of link 5 will then be at point OB and point P on link 6 will be at P. Add a new link of length OAOC between P and P. This is the new output link 8 and all points on it Remove link 5 and reduce link 6 to a binary link. The result is a Watt I sixbar with links numbered 1, 2, 3, 4, 6, and 8 see next page. Link 8 is in curvilinear translation and L3, L4 in Figure P37 to graphical accuracy. Given Link lengths Link 2 L2 1.00 Link 3 L3 2.06. Link 4 L4 2.33 Link 1 L1 2.22. Barker classification Class I2, Grashof crank-rocker-rocker, GCRR, since the shortest link Draw the linkage in these two positions and measure the Determine its Grashof condition and its minimum and Given Link lengths Link 2 L2 2.00 in Link 3 L3 8.

375 in. Link 4 L4 7.187 in Link 1 L1 9.625 in. Barker classification Class I2, Grashof crank-rocker-rocker, GCRR, since the shortest link Draw the linkage in these two positions and measure the Given Link lengths Coupler point data. Ground link L1 2.22 Crank L2 1.0 A1P 3.06 31.00 deg. Solution See Figure P39 and Mathcad file P0324. Note that the Crank length L2 1.000 L10 3.060 L7 0.812 Coupler length L3 2.060 L9 1.485 L6 1.893 Coupler angle 31.000 deg 31.000 deg 39.344 deg Given Link lengths Coupler point data. Solution See Figure P39 and Mathcad file P0325. Note that the Crank length L2 1.000 L10 3.060 L7 0.812 Rocker length L4 2.330 L8 3.461 L5 1.674 Coupler angle 31.000 deg 31.000 deg 39.344 deg They are OAA2PB3OB, OAA1PA3OC, Crank length L10 3.060 L2 1.000 L4 2.330 Coupler length A2P 1.000 A1P 3.060 L5 1.674 Rocker length L4 2.330 L8 3.461 L7 0.812 Crank length L5 1.674 L7 0.812 L8 3.461 Coupler point A2P 1.000 A1P 3.060 B1P 1.674 Coupler angle 0.00 deg 0.00 deg 0.00 deg Given Link lengths Coupler point data. Solution See Figure P39 and Mathcad file P0326. FOURBAR for Windows File P0326.DAT. Angle Cpler Pt Cpler Pt Cpler Pt Cpler Pt. Deg Label their intersection O6. Provide a guide on link 6 to accommodate Extend line CDE from point E a distance equal to CD. Label the end point F. Layout two intersecting lines through E and F such that they subtend an angle of 45 deg. Label their Link 6 L6 2.330 Link 7 L7 3.000 Link 8 L8 3.498. Fixed pivot O6 x 1.892 Fixed pivot O8 x 1.379 Given Link

lengths Coupler point data. Solution See Figure P39 and Mathcad file P0327. FOURBAR for Windows File P0326.DAT. DegLabel their intersection O6. Provide a guide on link 6 to accommodate Attach link 7 to the pivot at C. The length of link 7 is CD, a design choice. Extend line CDE from point D a distance equal to CE. Label the Link 6 L6 4.351 Link 7 L7 2.000. Fixed pivot O6 x 1.892 Given Link lengths Coupler point data. Ground link L1 45 Crank L2 56 A1P 11.25 0.000 deg. Coupler L3 22.5 Rocker L4 56.

Solution See Figure 326 and Mathcad file P0328. Note that the Crank length L2 56.000 L10 11.250 L7 28.000 Coupler length L3 22.500 L9 28.000 L6 28.000 Coupler point A1P 11.250 A2P 56.000 A3P 56.000 Coupler angle 0.000 deg 0.000 deg 0.000 deg The free end of link 5 will then be at point OB and point P on link 6 will be at P. Add a This is the new output link 8 and all points on it describe the Remove link 5 and reduce link 6 to a binary link. Watt I sixbar with links numbered 1, 2, 3, 4, 6, and 8. Link 8 is in curvilinear translation and follows the It does not attach to Given Link lengths Coupler point data. Ground link L1 4 Crank L2 2 A1P 0.500 0.00 deg. Coupler L3 1 Rocker L4 2 B1P 0.500 0.00 deg. Solution See Figure 329a and Mathcad file P0329. All three mechanisms are nonGrashof with limited Given Link lengths Coupler point data. Ground link L1 2 Crank L2 1 A1P 1.000 60.0 deg. Coupler L3 1 Rocker L4 1 B1P 1.000 60.0 deg. Solution See Figure 329b and Mathcad file P0330. All three mechanisms are nonGrashof with limited crank Specify all linkage parameters. Given Length of straight line motion x 150 mm. Percentage of cycle over which straight line motion takes place 22%. Solution See Figure 330 and Mathcad file P0331. Link ratios from Table 31 for 22% cycle. $L1/L2$ 1.975 $L3/L2$ 2.463 $x/L2$ 1.845. Crank L2 Coupler L3 $L3/L2$ L2 L3 200.24 mm Ground link L1 $L1/L2$ L2 L1 160.57 mm Rocker L4 L3 L4 200.24 mm Coupler point AP 2 L3 AP 400.49 mm Cy 2 L3 2 Using the PRINT facility, determine the x,y coordinates of the coupler curve and the x,y components of the A table of these values is printed below. Notice the small FOURBAR for Windows File P0331.DOC. Angle Cpler Pt Cpler Pt Veloc CP Veloc CP. Step X Y X Y Specify all linkage parameters. Given Length of straight line motion x 200 mm. Percentage of cycle over which straight line motion takes place 39%. Solution See Figure 330 and Mathcad file P0332. Link ratios from Table 31 for 39% cycle. $L1/L2$ 2.500 $L3/L2$ 3.

250 $x/L2$ 3.623. Crank L2 Coupler L3 $L3/L2$ L2 L3 179.41 mm Ground link L1 $L1/L2$ L2 L1 138.01 mm Rocker L4 L3 L4 179.41 mm Coupler point AP 2 L3 AP 358.82 mm Cy 2 L3 2 Using the PRINT facility, determine the x,y coordinates of the coupler curve and the x,y components of the A table of these values is printed below. Notice the small FOURBAR for Windows File P0332.DAT. Angle Coupler Pt Coupler Pt Veloc CP Veloc CP. Step X Y X Y Solution See Figures 316, 321, and Mathcad file P0333. Angle PAB Length AP on coupler AP 2 L3. Solution See Figures 316, 321, and Mathcad file P0334. Coupler angle, 252 deg. Ground link 1 length L1 GLR L2 L1 5.000 Angle PAB Length AP on coupler AP 2 L3. Show that there are or are not true cusps on Solution See Figures 316, 321, and Mathcad file P0334. Coupler angle, 144 deg. Angle PAB Length AP on coupler AP 2 L3. As seen below for the range of crank angle from 50 to 70 degrees, the magnitude of the velocity does not Given Link lengths Link 2 L2 0.785 Link 3 L3 0.356. Link 4 L4 0.950 Link 1 L1 0.544. Barker classification Class I3, Grashof rockercrank rocker, GR CR, since the shortest link Draw the linkage in these two positions and measure the Given Link lengths Coupler point data. Ground link L1 0.544 Crank L2 0.785 A1P 1.09 0.00 deg. Coupler L3 0.356 Rocker L4 0.950. Solution See Figure P310 and Mathcad file P0337. Note that the Crank length L2 0.785 L10 1.090 L7 1.619 Coupler length L3 0.356 L9 2.404 L6 1.959 Coupler point A1P 1.090 A2P 0.785 A3P 0.950 Coupler angle 0.000 deg 0.000 deg 180.000 deg Given Link lengths Coupler point data. Solution See Figure P310 and Mathcad file P0338. Note that the Crank length L2 0.785 L10 1.090 L7 1.619 Coupler length L3 0.356 L9 2.404 L6 1.959 Rocker length L4 0.950 L8 2.909 L5 0.734 Coupler point A1P 1.090 A2P 0.785 A3P 0.950 They are OAA2PA3OB, OAA1PB3OC, Crank length L10 1.090 L2 0.785 L4 0.950 Coupler length A2P 0.785 A1P 1.090 L5 0.734 Rocker length A3P 0.950 L8 2.909 L7 1.619 Crank length L5 0.734 L7 1.

619 L8 2.909 Coupler point A2P 0.785 A1P 1.090 B1P 0.734 Coupler angle 0.00 deg 0.00 deg 0.00 deg
 Given Link lengths Link 2 L2 0.86 Link 3 L3 1.85. Link 4 L4 0.86 Link 1 L1 2.22. Barker classification Class II1, nonGrashof triple rocker, RRR1, since the longest link is
 Draw the linkage in these two positions and measure the
 Given Link lengths Coupler point data. Ground link L1 2.22 Crank L2 0.86 A1P 1.33 0.00 deg. Coupler L3 1.85 Rocker L4 0.86. Solution See Figure P311 and Mathcad file P0340. Note that the
 Crank length L2 0.860 L10 1.330 L7 0.242 Coupler length L3 1.850 L9 0.618 L6 0.242 Rocker length L4 0.860 L8 0.618 L5 0.520 Coupler point A1P 1.330 A2P 0.242 A3P 0.618 Coupler angle 0.000 deg 180.000 deg 180.000 deg
 Given Link lengths Coupler point data. Solution See Figure P311 and Mathcad file P0341. Note that the
 Crank length L2 0.860 L10 1.330 L7 0.242 Rocker length L4 0.860 L8 0.618 L5 0.520 Coupler angle 0.000 deg 180.000 deg 180.000 deg
 They are OAB2PB3OB, OAA1PA3OC, Crank length L10 1.330 L2 0.860 L4 0.860 Coupler length L2 0.860 A1P 1.330 L5 0.520 Rocker length L4 0.860 L8 0.618 L7 0.242 Crank length L5 0.520 L7 0.242 L8 0.618 Coupler point L2 0.860 A1P 1.330 B1P 0.520 Coupler angle 0.00 deg 0.00 deg 0.00 deg
 Given Link lengths Link 2 L2 0.72 Link 3 L3 0.68. Link 4 L4 0.85 Link 1 L1 1.82. Barker classification Class II1, nonGrashof triple rocker, RRR1, since the longest link
 Draw the linkage in these two positions and measure the
 Given Link lengths Coupler point data. Ground link L1 1.82 Crank L2 0.72 A1P 0.97 54.0 deg. Coupler L3 0.68 Rocker L4 0.85.

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