CBCS SCHEME

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Kinematics of Machines

Time: 3 hrs.   Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Define the following with sketches :
   - i)   Lower Pairs
   - ii) Higher Paris
   - iii) Inversion
   - iv) Mechanism.   (08 Marks)
   b. Explain the Whitworth quick return motion mechanism with a neat sketch.   (08 Marks)

OR

2 a. Explain with a neat sketch Pantograph mechanism, state its applications.   (06 Marks)
   b. Explain with a neat sketch Geneva mechanism.   (06 Marks)
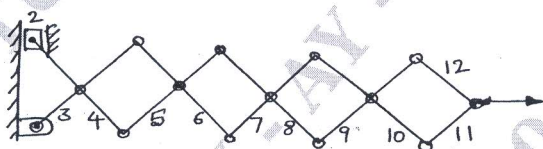   c. Find the degree of freedom for the following mechanism (Fig Q2(c).(i) and (ii).
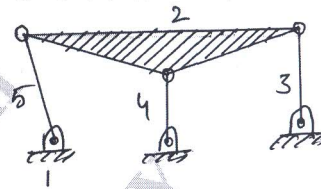

Fig Q2(c) i)   Fig Q2(c) ii)   (04 Marks)

Module-2

3 In the mechanism show in Fig Q3 the crank OA rotates at 20 rpm anti clockwise and gives motion to the sliding blocks B and D. The dimensions of the various links are
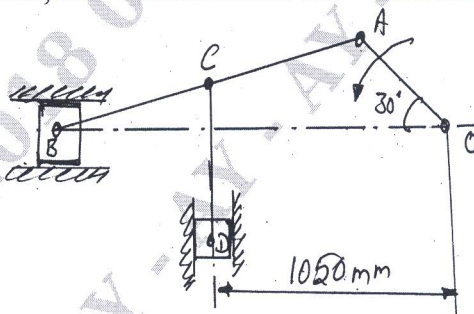   OA = 300mm, AB = 1200mm, BC = 450mm and CD = 450mm.

Fig Q3

For the given configuration, determine ;
   - i)   Velocity of sliding at B and D
   - ii) Angular velocity of CD
   - iii) Linear acceleration of D and
   - iv) Angular acceleration of CD.   (16 Marks)

OR

4 a. Write a note on Kennedy's theorem.   (08 Marks)
   b. A four bar chain of links PQ, QR and RS are 62.5mm, 175mm and 120mm long respectively, the link PS of chain PQRS is fixed and having length of 200mm. The link PQ makes an angle of 60° with PS and rotates at 10 rad/sec clockwise. Find the instantaneous centers and Determine: Angular velocity of link QR and RS.   (08 Marks)

Module-3

5 a. Explain the method of finding acceleration of various elements by Klein's equations.
                                                                                             (10 Marks)
   b. Explain in brief loop closure equation.   (06 Marks)

OR

6 The crank of a reciprocating engine is 90mm long, the connecting rod is 360mm long and the crank rotates at 150 rpm clockwise. Find the velocity and acceleration of the piston and the angular velocity and angular acceleration of the connecting rod, when the angle which the crank makes with inner dead angle is 30°. Solve the problem through complex algebra.
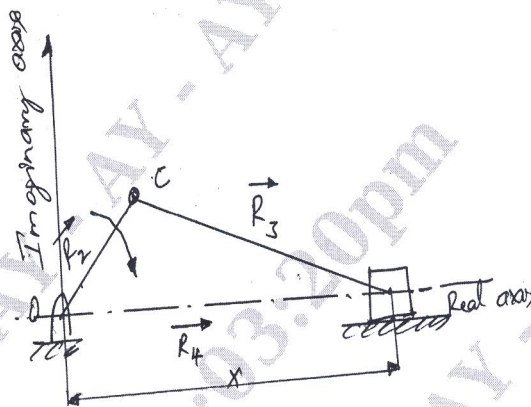   [Refer Fig Q6]

Fig Q6   (16 Marks)

Module-4

7 a. Derive on expression for the arc of contact.   (08 Marks)
   b. The number of teeth on a 20° full depth involute gear is 22, and the module is 12mm.
       Calculate : i) Pitch circle radius   ii) Thickness of tooth at the pitch circle
                   iii) Base circle radius and   iv) Thickness of tooth at the base circle.   (08 Marks)

OR

8 a. In a reduction gear shown in Fig Q8(a) the input "S" has 24 teeth, P and C constitue a compound planet having 30 and 18 each respectively. If all game are of the same pitch, find the ratio of the reduction gear. Assume "A" to be fixed.
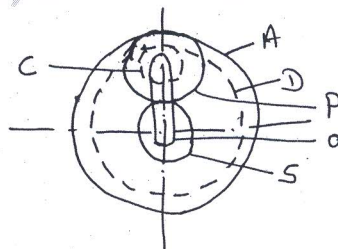

Fig Q8(a)   (10 Marks)
   b. Explain types of gear trains.   (06 Marks)

Module-5

9 The following data relate to cam profile in which the roller follower moves with SHM during ascent and descent.

Minimum radius of the cam = 25mm

Roller diameter = 8mm, lift = 30mm, Offset of follower axis = 10mm, towards right

Angle of assent 60 degrees and descent 90 degrees Angle of dwell between ascent and descent 45 degrees. Speed of the cam 200 rpm.

Draw the profile of cam and find maximum velocity and acceleration of a cam.   **(16 Marks)**

OR

10 Construct the profile of a cam to suit the following specifications.

Cam shaft diameter   = 20mm

Least radius of the cam = 25mm

Diameter of the roller   = 25mm

Angle of lift 120° and fall 150°

Lift of the follower   = 40mm

Number of pauses are two of equal interval between motion. During the lift the motion is SHM. During the fall motion is UARM. The speed of cam shaft is uniform. The line of stroke is offset to 12.5mm towards right of the cam center.   **(16 Marks)**

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