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10ME/AU44

Fourth Semester B.E. Degree Examination, June/July 2017
Kinematics of Machines

Time: 3 hrs.

Max. Marks: 100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

- 1 a. What is an inversion? Give the inversions of double slider crank chain. Explain any one with neat sketch. (10 Marks)
- b. Distinguish between: i) Lower pair and higher pair ii) Completely constrained and successfully constrained motion. (10 Marks)
- 2 a. Sketch and explain Geneva wheel and Ackermann steering mechanism. (10 Marks)
- b. Same different quick return mechanisms and explain any one with neat sketch. Why the names quick return mechanism? (10 Marks)
- 3 a. What are centripetal and tangential acceleration components? (04 Marks)
- b. A four bar mechanism has a fixed link $AD = 1\text{m}$ driving crank $AB = 0.3\text{m}$, follower link $CD = 0.6\text{m}$ and the connecting link is 1.2m . The crank rotates at a speed of 300 rpm clockwise with an angular acceleration of 200 r/sec^2 in anticlockwise direction. When the angle made by the crank with a fixed link is 135° in anticlockwise direction, determine,
 - i) Angular velocity of the link BC and CD
 - ii) Angular acceleration of the link BC and CD
 - iii) Acceleration of B and C. (16 Marks)
- 4 a. State and prove Kennedy's theorem. (05 Marks)
- b. The length of the crank and connecting rod of a reciprocating engine are 200mm and 800mm respectively. The crank is rotating at a uniform speed of 480 rpm. Using Klein's construction. Find :
 - i) acceleration of piston
 - ii) acceleration of the middle point of the connecting rod and
 - iii) angular acceleration of the connecting rod when the crank has turned through 45° from the inner dead center. (15 Marks)

PART – B

- 5 The slider crank of an internal combustion engine has a crank of 150mm length and a connecting rod of 600mm length. The crank rotates at a constant speed of 300rpm counter clockwise. Determine the position, velocity and acceleration of the slider when the crank angle is 45° from the inner dead center position by complex algebra. (20 Marks)
- 6 a. What is interference? Explain the methods of avoiding it. (08 Marks)
- b. Two gear wheels mesh externally are to give a velocity ratio of 3. Involute teeth arc of 6mm module and 20° pressure angle. The standard addendum is one module and the pinion rotates at 400 rpm. Find number of teeth on each wheel, so that the interference is just avoided, length of path of contact, maximum velocity of sliding between the teeth, arc of contact and contact ratio. (12 Marks)

- 7 a. Name different types of gear trains. Give a note on gear train used in lathe head stock. (06 Marks)
- b. The Fig Q7 (b) shows an epicyclic gear train where the arm A is the driver and annular gear D is the follower. The wheel B has 48 teeth, B runs freely on P and D is separately driven. The arm A runs at 100rpm and the wheel D at 50rpm in same direction, find the torque on B if A receives 7.5kW. (14 Marks)
- 8 A cam with 25mm as minimum radius is rotating clockwise at uniform speed of 100rpm and has to give the motion to a knife edge follower as mentioned below.
- Follower to move outwards through 25mm during 120° of cam rotation.
 - Follower to dwell for next 60° of cam rotation
 - Follower to return to original position by next 90° of cam rotation
 - Follower to dwell for rest of cam rotation.

The displacement of the follower takes place with uniform acceleration and retardation on both outward and return strokes. Draw the cam profile when follower axis passes through the axis of cam. Determine the maximum velocity and acceleration during outstroke and return stroke. (20 Marks)

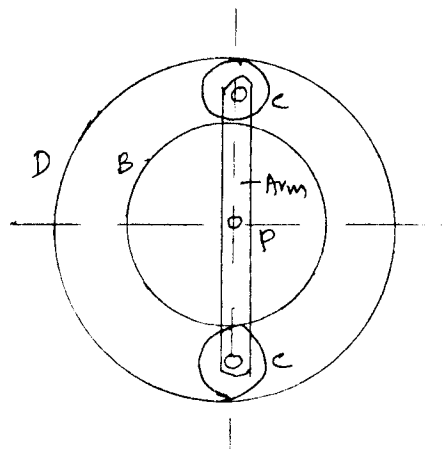


Fig Q8

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