[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2125)

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B. Tech 5th Semester Examination

Kinematics of Machine (OS)

ME-5001

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five question in all, selecting one question each from Section A, B, C & D. Section-E is compulsory.

SECTION - A

1. In a slider crank mechanism the crank is 200 mm long and rotates at 40 rad/sec in a CCW direction. The length of the connecting rod is 800 mm. When the crank turns through 60º from Inner-dead centre. Determine (i) The velocity of the slider (ii) Velocity of point E located at a distance of 200 mm on the connecting rod extended, (iii) The position and velocity of point F on the connecting rod having the least absolute velocity, (iv) The angular velocity of connecting rod (v) The velocity of rubbing of pins of crank shaft, crank and cross head having pins diameters 80.60 and 100 mm respectively. (15)

2. (a) What are the relative merits and demerits of the Ackermann type of steering gear over that of Davis type?

   (b) What is instantaneous? State and Explain Kennedy's theorem as applicable to instantaneous centre of rotation of three bodies. (7+8=15)

[P.T.O.]

SECTION - B

3. Draw the cam profile for following conditions:

   Follower type = roller follower, off set to the right of cam axis by 18mm; lift = 35mm: base circle radius = 50mm; roller radius=14mm; out stroke with SHM in 0.05 sec; dwell for 0.0125 sec; return stroke with uniform acceleration and deceleration, during 0.125 sec; dwell for the remaining period. During return stroke, acceleration is 3/5 times retardation. Determine max. velocity and acceleration during out stroke and return stroke if the cam rotates at 240 rpm. (15)

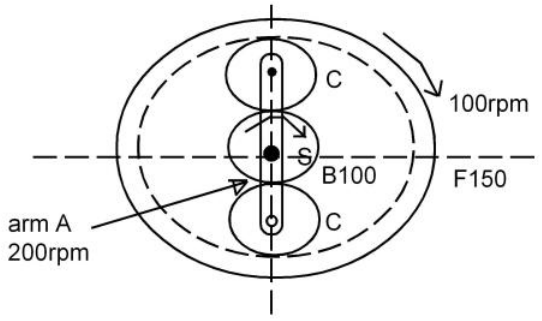
4. (a) With the help of neat sketches explain the types of cams and followers.

   (b) Explain the terms: base circle, pitch circle, pressure angle, pitch curve, trace point and prime circle. (8+7=15)

SECTION - C

5. (a) How will you generate involutes curve? What are the factors which favours to use involutes' profile in gears?

   (b) In an epicyclic gear train shown in figure, the arm A is fixed to this shaft S. The wheel B having 100 teeth rotates freely on the shaft S. The wheel F having 150 teeth driven separately. If the arm rotates at 200 rpm and wheel F at 100 rpm in the same direction; find (a) number of teeth on the gear C and (b) speed of wheel B. (7+8=15)



6. (a) State and prove the law of gearing. Show that involute profile satisfies the condition for correct gearing.

   (b) A pair of spur gears with involute teeth is to give a gear ratio of 4:1. The arc of approach is not to be less than the circular pitch and smaller wheel is the driver. The angle of pressure is 14.5°. Find the least number of teeth that can be used on each wheel and the addendum of the wheel in terms of the circular pitch. (7+8=15)

SECTION - D

7. (a) Determine the Chebyshev spacing for function $y=x+3x^2$ for the domain $0 \leq x \leq 3$. For these points determine θ_1, θ_2, θ_3 and ϕ_1, ϕ_2, ϕ_3 if $20° \leq \theta \leq 80°$ and $30° \leq \phi \leq 130°$.

   (b) Explain the procedure of determine the relative pole for four bar chain. (10+5=15)

8. Determine the length of all the four links in four bar chain for the length of the smallest being 10 cm to generate $y=\log_m x$ in the interval $1 \leq x \leq 10$ for three accuracy points. The range of angles of input link and output link are $45° \leq \theta < 105°$ and $135° \leq \phi \leq 225°$. (15)

SECTION - E

9. (a) What is difference between resistant body and rigid body? Explain with examples.

   (b) What is Kinematic link? Show all kinematic links on single Slider-crank chain.

   (c) Give the relation suggested by AW Klien. How it is used to decide the nature of chain having ternary & binary joints?

   (d) Explain how the motion of follower depends upon the shape of the cam?

   (e) What are the essential members of a cam mechanism? Describe briefly.

   (f) Explain that in four stroke engine how the angle of ascent, the angle of decent and the angle of dwell fixed?

   (g) Define normal pitch, circular pitch and helix angle. What is the relation among these?

   (h) Explain the term train value. How is it related to velocity ratio?

   (i) What are advantages of epicyclic gearing?

   (j) Explain the synthesis of mechanism with examples. (4×10=40)