

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 4080

Roll No.

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B.Tech.

(SEM IV) EVEN SEMESTER THEORY EXAMINATION,
2009-2010

KINEMATICS OF MACHINE

Time : 3 Hours

Total Marks : 100

Note : (i) Answer *all* the questions.

(ii) All questions carry *equal* marks.

(iii) Assume suitable value for missing data if any.

1. Answer any four parts : (4x5=20)

(a) Distinguish between Mechanism and Machine.

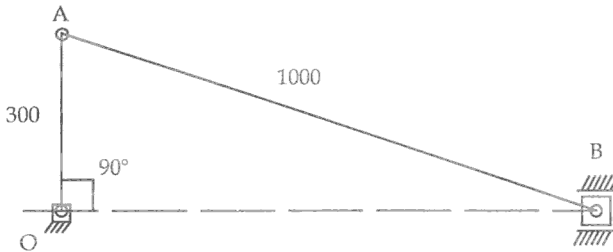
(b) Explain mechanical advantage and transmission angle of a mechanism.

(c) Describe various inversions of a slider crank mechanism.

(d) What is a *Velocity image* ? Explain its usefulness.

(e) What are *class-I and class-II* four bar linkage

- (f) Locate all the *instantaneous centres* for the mechanism shown in fig. below.



2. Answer **any two** parts : (2x10=20)
- (a) For what purpose is a pantograph used ? Sketch one form of pantograph and show that it satisfies the required conditions.
 - (b) Two shafts are coupled together by a Hook's joint, the driving shaft rotating uniformly at 600 rpm. Find the greatest permissible angle between the shafts if the maximum speed of the follower shaft is 630 rpm. Prove your reasoning.
 - (c) Explain the procedure to construct Klein's construction to determine the velocity and acceleration of a slider-crank mechanism.
3. Answer **any two** parts : (2x10=20)
- (a) What is the pole of a coupler link of a four-link mechanism ? Enumerate its properties. What is a relative pole ?

- (b) What is Freudenstein's equation? How is it helpful in designing a four-link mechanism when three positions of the input ($\theta_1, \theta_2, \theta_3$) and the output link (Φ_1, Φ_2, Φ_3) are known?
- (c) Explain Grashof's law. What do you mean by inversion of Grashof's linkage?
4. Draw the profile of a cam operating a roller reciprocating follower with the following data : (20)
- Minimum radius of the cam = 25 mm,
Lift = 30mm, Roller diameter = 15 mm, the cam lifts the follower for 120° with SHM followed by a dwell period of 30° . Then the follower lowers down during 140° of the cam rotation with uniform acceleration and deceleration followed by a dwell period. If the cam rotates at uniform speed of 160 rpm, calculate the maximum velocity and acceleration of the follower during the descent period.

OR

- (a) What are the requirements of a high speed cam? (5)
- (b) What is a tangent cam? Find the expression for the velocity and acceleration of a roller follower for such a cam. (15)
5. Answer any two parts : (2x10=20)
- (a) What is the smallest number of teeth that can be used on each of the two wheels in order to avoid interference if the pressure angle is 14.5° and a standard addendum of one module is used? Find also the length of the arc of contact in terms of the circular pitch.

- (b) What is a differential gear of a automobile ?
How does it function ?
- (c) (i) What types of gears are used for
parallel, intersecting and skew
shafts ?
- (ii) What is a gear train ? What are their
main types ?

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