

(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) THEORY EXAMINATION 2010-11

KINEMATICS OF MACHINE

Time : 3 Hours

Total Marks : 100

Note : (1) Answer all the questions.

(2) All questions carry equal marks.

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

1. Answer any **four** parts :

(5×4=20)

(a) Distinguish between :

(i) Mechanism and machine

(ii) Analysis and synthesis of mechanism

(iii) Kinematics and Dynamics.

(b) What is a configuration diagram ? What is its use ?

(c) State and explain *angular velocity ratio theorem* as applicable to mechanisms.

(d) Differentiate between Lower and Higher pairs giving examples.

(e) What is Transmission Angle ? Explain locking or jamming of a mechanism.

- (f) How many DOF would three links connected by revolute joints at B (figure 1) have ? Prove.

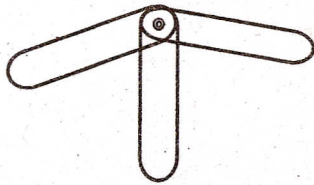


Figure 1

2. Answer any one part : (20×1=20)

(a) (i) Describe one form of mechanism, consisting of turning pairs only, that will give an exact straight line motion to a given point. Show that the path followed by the point is a true straight line. 10

(ii) A Hooke's joint connects two shafts whose axes intersect at 25° . What will be the angle turned by the driving shaft when (i) the velocity ratio is maximum, minimum and unit, (ii) the acceleration of the driven shaft is maximum, minimum (negative) and zero ?

10

(b) One cylinder of a rotary engine is shown in the configuration diagram in figure. OA is the fixed crank, 250 mm long. OP is the connecting rod and is 600 mm long. The line of stroke is along AR and at the instant is inclined at 45° to the vertical. The body of the engine consisting of the cylinders rotates at a uniform speed of 400 rpm about the fixed centre A. Determine (i) Acceleration of the piston (slider) inside the cylinder, (ii) Angular acceleration of the connecting rod.

20

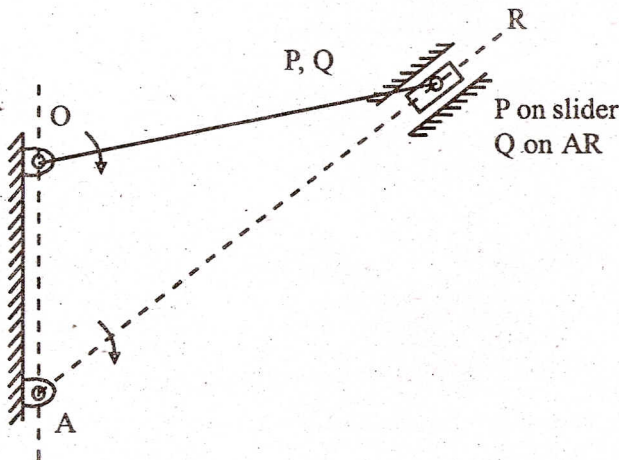


Fig. Q. 2 (b)

3. Answer any two parts : (10×2=20)
- Discuss the procedure to design the mechanism by inversion method.
 - Describe the procedure to design a slider-crank mechanism by relative pole method when three positions of the input ($\Theta_1, \Theta_2, \Theta_3$) and the slider (s_1, s_2, s_3) are known.
 - Describe the method for designing a four bar mechanism as a function generation.
4. Answer any two parts : (10×2=20)
- Draw follower displacement diagram which moves with simple harmonic motion, also deduce expression for velocity and acceleration of follower.

- (b) Derive relation for velocity and acceleration for a convex cam with a flat follower.
- (c) Why is a cycloidal motion programme most suitable for high speed cams ?

5. Answer any two parts :

(10×2=20)

- (a) Show that either the cycloidal or the involute shape for the profile of the wheel teeth satisfied the fundamental condition for the transmission of uniform motion. What are the principal advantages of the involute shape over cycloidal shape ?
- (b) In sun and planet gear train, the sun gear wheel having 60 teeth is fixed to the frame. Determine the number of teeth on the planet and the annulus wheels if the annulus rotates 130 times and the arm 100 times both in the same direction.
- (c) (i) What is standard system of gears ? How does it ensure interchangeability of gears ?
(ii) State and derive the law of gearing.