Question Paper

Exam Date & Time: 25-May-2022 (09:30 AM - 12:30 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES IV SEMESTER B.Sc.(Applied Sciences) in Engg. END SEMESTER THEORY EXAMINATION-MAY/JUNE 2022

Theory of Machines [IME 241]

Duration: 180 mins.

Marks: 50

Answer all the questions.

Any missing data if any, may be suitably assumed.

¹⁾ What is a kinematic link?. With help of neat sketches explain the types of ⁽²⁾ kinematic link.

A)

B) Find the total number of degrees of freedom for the given mechanisms ⁽⁴⁾ shown **Figure 1** and **Figure 2**



- C) With help of a neat sketch explain (4) (i)Oscillating cylinder engine mechanism (ii) Scotch Yoke Mechanism
- ²⁾ Locate all I centers for the mechanisms shown in Figure 3 and Figure 4. ^(2.5)

A)



B)

The configuration of a single slider mechanism is shown in the Figure 5. (2.5) The crank OA rotates with an angular velocity of 12 rad/s in counter clockwise direction. Find the magnitude and the direction of the centripetal acceleration of link AB (acceleration of point A with respect to B).



A simple quick return mechanism is shown in Figure 6. The dimensions of $^{(5)}$ various link are: OP (crank) = 80 cm, the distance between the centers OA =60 cm and AR=60 cm. The crank rotates at a speed of 20 rad/s. At the position shown, crank makes an angle 900 with the vertical.

(i) Draw the velocity diagram and find the magnitude and the direction of angular velocity of link AB and the sliding velocity of the slider.

(ii) Find the magnitude and the direction of the Coriolis acceleration.

(iii) The acceleration diagram of the mechanism is shown in Figure 7.

From the acceleration diagram identify all the components of acceleration vector and mark the corresponding direction.

(iv) Calculate the magnitude and the direction of the angular acceleration of AB and comment on its status (whether it is accelerating or decelerating).

(v) What is the magnitude of the vector X in the acceleration diagram.