



Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)



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# **III SEMESTER B.TECH END SEMESTER EXAMINATIONS**

# DEC 2015 / JAN 2016

## SUBJECT: KINEMATICS OF MACHINERY [MME 2102]

### **REVISED CREDIT SYSTEM**

Time: 3 Hours

MAX. MARKS: 50

#### Instructions to Candidates:

- ✤ Answer ALL the questions.
- Missing data may be suitably assumed.
- **1A.** Define the following:

i. Inversion ii. Machine iii. Mechanism iv. Link v. Higher Pair

- **1B.** With a neat sketch explain the working of crank and slotted lever mechanism. **05**
- **2A.** Define Instantaneous Centre. Explain the procedure for locating different **05** Instantaneous Centres for a given mechanism.
- 2B. In a four bar chain ABCD shown in fig Q2B, AD is fixed and is 15 cm long.
  05 The crank AB is 4 cm long and rotates at 120 rpm clockwise, while the link CD (= 8 cm) oscillates about D. BC and AD are of equal length. Find the angular velocity of link CD when angle BAD = 60°.



Fig. Q2B.

3A. The lengths of the crank and connecting rod of a horizontal reciprocating engine are 100 mm and 500 mm respectively. The crank is rotating at 400 rpm. Using Klein's construction, find: i) velocity of piston ii) angular velocity of the connecting rod iii) acceleration of piston when the crank has turned 30<sup>0</sup> from the inner dead center.

- **3B.** Derive an expression to determine the length of path of contact.
- 4A. The number of teeth on a 20<sup>0</sup> Full Depth Involute gear is 22 and module is 12 mm. Calculate the pitch circle radius, thickness of the tooth at the pitch circle, base circle radius and thickness of tooth at the base circle.
- 4B. A multi-plate disc clutch transmits 45 kW of power at 1750 rpm. Coefficient of friction for the friction surfaces is 0.1. Axial intensity of pressure is not to exceed 160 kN/m<sup>2</sup>. The internal radius is 80 mm and is 0.7 times the external radius. Find the number of plates needed to transmit the required torque.
- **5A.** An inline cam, with a minimum radius of 50 mm, rotating clockwise at a **05** uniform speed, is required to give a knife edge follower the motion as described below:
  - 1. To move outwards through 40 mm during 100° rotation of the cam;
  - 2. To dwell for next 80°;
  - 3. To return to its starting position during next 90°, and
  - 4. To dwell for the rest period of a revolution i.e. 90°.

The displacement of the follower is to take place with uniform velocity.

5B. Define an epicyclic gear train. Also derive an expression to determine the rpm of all gears in an epicyclic gear train as shown in figure Q5B, using tabular method.



Fig. Q5B.

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