No. of Printed Pages : 3 **Roll No. .....**

W431

B.Tech. EXAMINATION, 2020

(Third Semester)

(Weekend) (Re-appear Only)

KINEMATICS OF MACHINES

ME(W)202

ME

Time : 3 *Hours*] [*Maximum Marks :* 100

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt any *Five* questions. All questions carry equal marks.

1. (a) What do you mean by the term degree of freedom ? For a planar mechanism, derive the expression for Gruebler's criterion. **8**

(b) In a crank and slotted lever quick return motion mechanism, the distance between the fixed centres is 150 mm and the driving crank is 100 mm long. Give examples of their applications. Find the ratio of times taken in forward and return stroke for one of these mechanisms. **12**

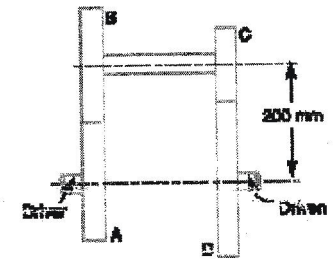
2. (a) What are centripetal and tangential component of acceleration ? When do they occur ? How are they determined ? **8**

(b) Explain different methods to locate Instantaneous Centre in a mechanism. **12**

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

(b) A pinion of 32 involute teeth and 4 mm module drives a rack. The pressure angle is 200. The addendum of both pinion and rack is same. Determine the maximum permissible value of the addendum to avoid interference. Also, find the number of pairs of teeth in contact. **12**

4. The speed ratio of the reverted gear train, as shown in Figure is to be 12. The module pitch of gears A and B is 3.125 mm and of gears C and D is 2.5 mm. Calculate the suitable numbers of teeth for the gears. No gear is to have less than 24 teeth. **20**



5. Draw the profile of the cam when the roller follower moves with cycloidal motion during out stroke and return stroke, as given below :

(i) Out stroke with maximum displacement of 31.4 mm during 180° of cam rotation.

(ii) Return stroke for the next 150° of cam rotation.

(iii) Dwell for the remaining 30° of cam rotation. The minimum radius of the cam is 15 mm and the roller diameter of the follower is 10 mm. The axis of the roller follower is offset by 10 mm towards right from the axis of cam shaft. **20**

6. What do you understand by :

(i) Type synthesis

(ii) Number synthesis

(iii) Dimensional synthesis ? Explain Freudenstein's method of three point synthesis of mechanism. **20**

7. Describe the kinematics of robotics manipulators. **20**

8. (a) Explain the following terms :

(i) Cam angle and pressure angle in the case of cam and follower

(ii) Differential gears.

(b) Differentiate the following terms :

(i) Closed and unclosed pairs

(ii) Circular pitch, Pressure angle, Path of contact, as applied to gear with a neat sketch. **20**