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

Paper ID :140522 Roll No. | | | | | | | | | |

B.Tech.

(SEM. V) THEORY EXAMINATION, 2015-16

THEORY OF MACHINES-I

[Time:3 hours] **[Total Marks:100]**

Section-A

1. Attempt **all** parts. All parts carry equal marks. Write answer of each part in short. (10x2=20)

   (a) In a crank and slotted lever quick return mechanism, the distance between the fixed centres is 300 mm and the driving crank is 150 mm long. Determine the ratio of the time taken on the cutting and return strokes.

   (b) Write the difference between a machine and a mechanism.

   (c) Write the relation between the number of instantaneous centres and the number of links in a mechanism.

(d) What do you understand by 'centrifugal tension in a belt.

(e) How does the velocity ratio of a belt drive effect, when some slip is taking place between the belt and the two pulleys?

(f) What do you understand by the term 'undercutting' as applied to gears?

(g) What are different types of gear trains?

(h) State law of gearing.

(i) Determine whether the case is a kinematic chain or not?

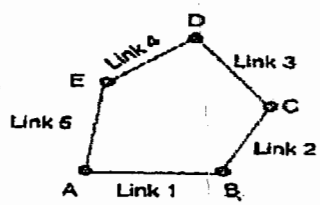


Fig: 1

(j) What do you mean by degree of freedom? Also write kutz-bach equation.

Section-B

Attempt **any five** questions from this section. (10×5=50)

2. Explain the term kinematic pair. How are the kinematic pairs classified? Explain with examples.

3. Discuss the inversion of double slider crank mechanism.

4. What do you understand by the term Coriolis component of acceleration? How is the sense and direction of this acceleratiion determined?

5. Explain Hart's mechanism for exact straight line motion.

6. A shaft which rotates at a constant speed of 160 r.p.m. is connected by belting to a parallel shaft 720 mm apart, which has to run at 60,80 and 100 r.p.m. The smallest pulley on the driving shaft is 40 mm in radius. Determine the remaining radius of the two stepped pulleys for a crossed belt and an open belt. Neglect belt thickness ans slip.

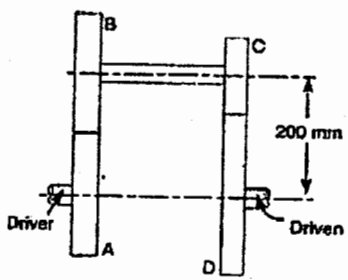
7. Two involute gears of 20° pressure angle are in mesh. The munber of teeth on pinion is 20 and the gear ratio is 2. If the pitch expressed in module is 5 mm and the pitch line speed is 1.2 m/s, assuming addendum as standard

and equal to one module, find:

(i) The angle turned through by pinion when one pair of teeth is in mesh and

(ii) The maximum velocity of sliding.

8. 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 3.125mm and of gears C and D is 2.5 mm. Calculate the suitable numbers of teeth for th gears. No gear is to have less than 24 teeth.



9. Explain Klein's construction for determining the velocity and acceleration of the piston in a slider crank mechanism with a neat sketch.

Section-C

Attempt **any two** questions from this section. (2x15=30)

10. Derive the expression for the length of path of contact, length of arc of contact and contact ratio for a gear system. In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 r.p.m. in the anticlockwise direction about the center of the gear A which is fixed, determine A. the speed of gear B. If the gear A instead of being fixed, makes 300 r.p.m. in the clockwise direction, what will be the speed of gear B?

11. A cam is to be designed for a knige edge follower with the following data: 1. Cam lift=40 mm during 90° of cam rotation with simple harmonic motion. 2. Dwell for the next for the next 30°.3. During the next 60° of cam rotation, the follower returns to its original position with simple harmonic motion. 4. Dwell during the remaining 180°. Draw the profile of the cam when the line of stroke of the follower passes through the axis of the cam shaft. The radius of the base circle of the cam is 40 mm. Determine the maximum velocity and acceleration of

the follower during its ascent and descent, if the cam rotates at 240 r.p.m.

12. An engine mechanism has the crank CB=100 mm and the connecting rod BA=300 mm with centre of gravity G, 100 mm from B. In the position shown, the crankshaft has a speed of 75 rad/s and an angular acceleration of 1200 rad/s2. Find:1. Velocity of G and angular velocity. of AB, 2. Acceleration of G and angular acceleration of AB.

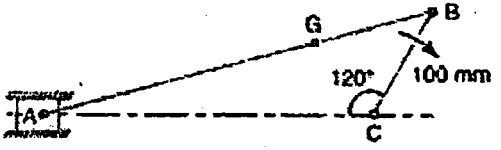


Fig: 2

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