Roll No. | | | | | | | | | | | | **Total No. of Pages : 04**

Total No. of Questions : 09

B.Tech. (AE/ME) (Sem.–3rd)
B.Tech. (IE) (Sem.–3rd) (2008-09 Batch)

THEORY OF MACHINES-I

Subject Code : ME-203
Paper ID : [A0802]

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students has to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.**

SECTION-A

1. Write short notes on :

(a) What is High Pair ?

(b) Explain why higher cannot be inverted?

(c) Explain Acceleration Centre of a Link.

(d) For the design of bearing why we use uniform pressure theory ?

(e) Write the applications of single plate clutch.

(f) Write the applications of cone clutch.

(g) What is the Law of Belting ?

(h) What is the advantage of using double Hooke's joint ?

(i) What is the difference between governor and flywheel ?

(j) Why cycloidal profile is preferred over S.H.M. profile for cams used in high speed applications ?

SECTION-B

2. In Fig.-1 a slider crank chain is shown.

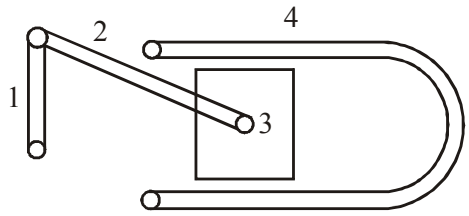

Fig.-1

link 1 = Crank

link 2 = Connecting rod

link 3 = slider

link 4 = Cylinder block

Which mechanism is obtained from the chain if link 3 is fixed ? Explain.

3. For the configuration shown in **Fig.-2**, determine V_D by instantaneous centre method if V_A = 635 mm/sec with ω_2 turning counter clockwise.

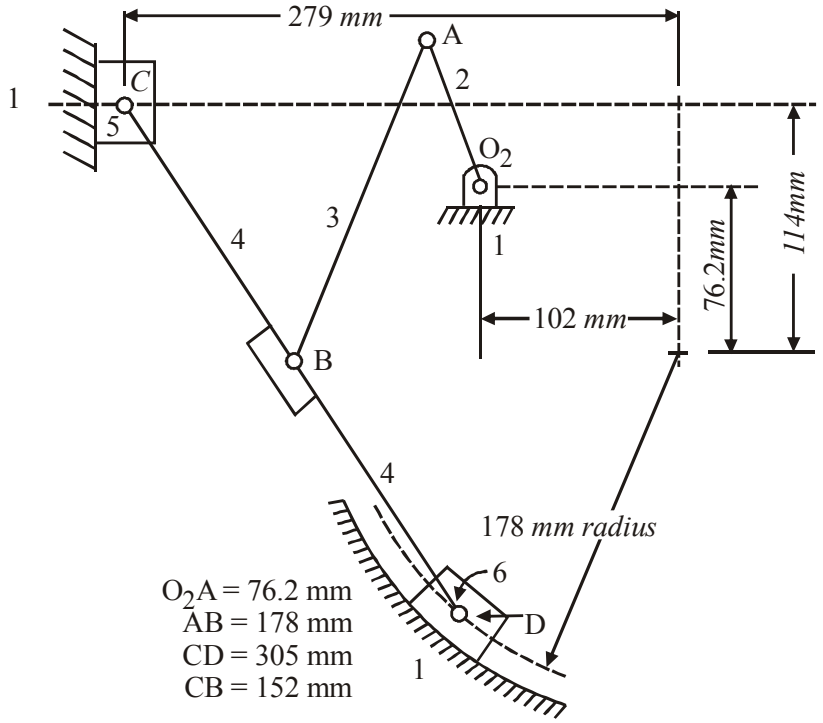

Fig.-2

4. The initial tension in a flat belt drive is 1800 N. The angle of lap on the smaller pulley is 170°. The coefficient of friction of the belt and pulley surface is 0·25. The pulley has a diameter of 0·9 m and it runs at 540 r.p.m. Determine the power that can be transmitted at the above speed. Neglect centrifugal tension.

5. In a turning moment diagram, the areas above and below the mean torque line taken in order are 395, 785, 140, 440, 1060 and 370 mm^2, having scales of 1 mm = 5 N-m and 1 mm = 10° along Y and X axis respectively. Find mass of flywheel at a radius of gyration 150 mm and maximum fluctuation of speed is limited to ± 1·5% of mean speed which is 1800 r.p.m.

6. A band brake is lined with 10 wooden blocks each of which subtends an angle of 18° at the centre of the brake drum. Find the ratio between the greatest and the least tensions in the band when the brake is in action. Take $\mu = 0{\cdot}36$.

SECTION-C

7. Two parallel shafts indicated in **Fig.-3** are connected by an intermediate shaft with a Hooke's joint at each end. Show that the joints should be oriented to obtain a constant angular velocity ratio between the driving and driven shafts.

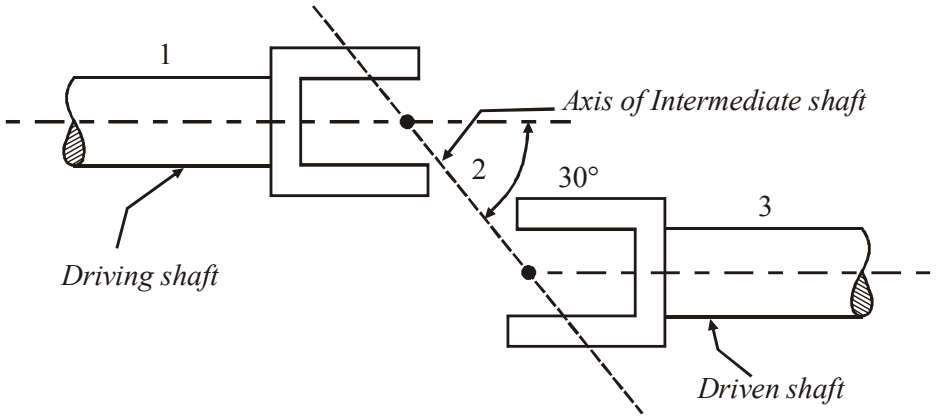

Fig.-3

The intermediate shaft of the above arrangement has a mass moment of inertia 3×10^{-3} kg-m^2 and is inclined at 30° to the axes of the driving and driven shafts. If the driving shaft rotates uniformly at 2400 r.p.m. with a steady input torque of 300 N-m, determine the maximum fluctuation of output torque.

8. A governor is shown in Fig.-4 schematically. The two links which carry the balls of mass *m* each are connected by a spring of stiffness *k* and has a natural length of 2*e*. Find out the expression for the inclination of the links with vertical when the governor rotates at a speed ω.

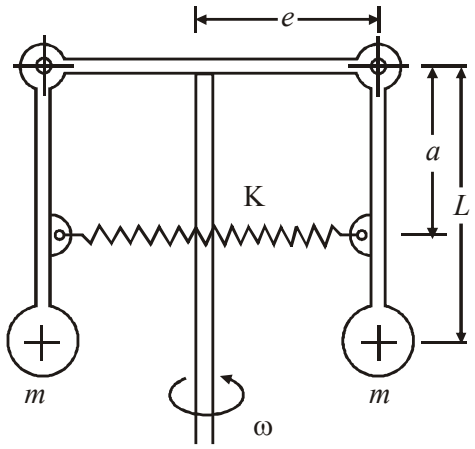

Fig.-4

9. For a cam follower system shown in Fig.-5, draw the displacement diagram for the follower and cam profile. Motion of the follower is as follows : Rise through 20° in 90° cam rotation in SHM, dwell in 90° cam rotation, S.H.M. fall in 90° cam rotation, dwell during 90° cam rotation. If N = 2500 r.p.m., find the max. angular velocity and angular acceleration of the pivoted follower.

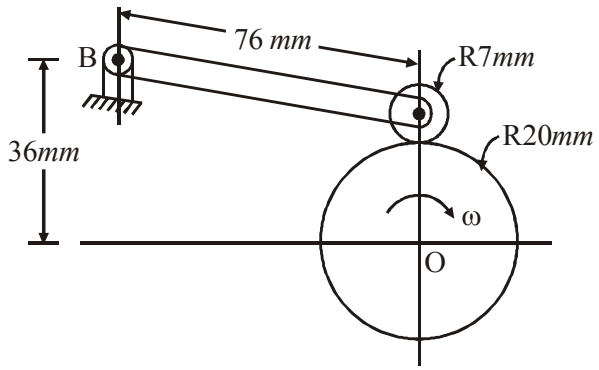

Fig.-5