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B.E./B.Tech. (FULL - TIME) ARREAR EXAMINATIONS APRIL / MAY 2011

Agriculture and irrigation Engineering Branch

III SEMESTER – (REGULATIONS 2004)

AI -272 – THEORY OF MACHINES

Time: 3 hours

Maximum marks: 100.

PART – A

(10 x 2 = 20 Marks)

1. State the Kutzbach criterion
2. How to represent the direction of linear velocity of any point on a link with respect to another point on the same link
3. Define pressure angle and lift in cam and follower
4. Write the expression for total frictional torque on the flat pivot bearing considering uniform pressure theory.
5. What is the theory to be assumed for old and new clutch
6. What do you mean by “crowning in pulley”
7. Draw the displacement, velocity and acceleration diagram for cycloid motion in cam and follower.
8. What is the difference between radial cam and cylindrical cam
9. When do we use bevel and helical gears
10. What do you mean by Isochronous governors

PART – B

(5 x 16 = 80 Marks)

11. Derive an expression for the friction torque of a collar bearing considering uniform pressure and uniform wear theory.
12. (a) Determine the linear velocity of the slider D and the angular velocity of the link BD, when the crank is inclined at an angle of 75° to the vertical for the mechanism as shown in fig1. The dimensions of the various links are $OA=28\text{mm}$, $AB=44\text{mm}$, $BC=49\text{mm}$, $BD=46\text{mm}$. The centre distance between the centres of rotation O and C is 65mm . The path of travel of the slider is 11mm below the fixed point C. The slider moves along a horizontal path and OC is vertical.

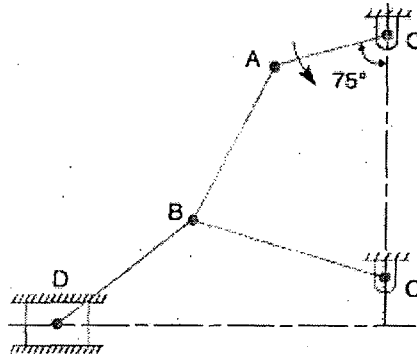


Fig.1.

(OR)

- 12 (b) (i) Write the relation between the number of instantaneous centres and the number of links in a mechanism
(ii) Discuss the three types of instantaneous centres for a mechanism
(iii) State and prove the “ Kennedy” theorem of three instantaneous centres
13. (a) A flat belt is required to transmit 35 kW from a pulley of 1.5m effective diameter running at 300 rpm. The angle of contact is spread over $1\frac{1}{4}$ of the circumference and the coefficient of friction 0.3. Determine, taking centrifugal tension into account, width of the belt required. It is given that the belt thickness is 8.5mm, density of the material 1.1Mg/m^3 and the working stress is 2.5MPa.

(OR)

13. (b) Obtain an expression for the length of a belt in 1. an open belt drive 2. a cross belt drive.
14. (a) It is required to set out the profile of a cam to give the following motion to the reciprocating follower with a flat faced follower. The follower to have a stroke of 40mm during 120° of cam rotation. Follower to dwell for 30° of cam rotation. Follower to return to its initial position during 120° of cam rotation and the follower to dwell for remaining 90° of cam rotation. The minimum radius of the cam is 25mm. The outstroke of the follower is performed with equal uniform acceleration and retardation and the return stroke with S.H.M.

(OR)

14. (b) Design a cam to raise a valve with S.H.M through 50mm in $\frac{1}{3}$ of a revolution keep it fully raised through $\frac{1}{12}$ revolution and to lower it with harmonic motion in $\frac{1}{6}$ revolution. The valve remains closed during the rest of the revolution. The diameter of the roller is 20mm and the minimum radius of the cam is 25mm. The axis of the valve rod passes through the axis of the camshaft.
15. (a) A single cylinder four stroke gas engine develops 20kW at 300rpm. The work done by the gases during the expansion stroke is three times the work done on the gases during the compression stroke, the work done during the suction and exhaust strokes being negligible. If the total fluctuation of speed is not to exceed 4 percent of the mean speed and the turning moment diagram during compression and expansion is assumed to be triangle in shape, find the moment of inertia of the flywheel

(OR)

- 15 (b) The upper arms of a porter governor have lengths 350mm and are pivoted on the axis of rotation. The lower arms have lengths 300mm and are attached to the sleeve at a distance of 40mm from the axis. Each ball has a mass of 4 kg and mass on the sleeve is 45kg. Determine the equilibrium speed for a radius of rotation of 200mm and find also the effort and power of the governor for 1 percent speed change.