21/11/15.

ANNA UNIVERSITY

AI 8303 – Theory of Machines – Regulation 2012

III Semester – B.E. Agricultural and Irrigation Engineering

Duration : 3 Hours **Max. Marks:100**

4

Answer ALL questions

Part – A (2 x 10 = 20 marks)

1. Distinguish between Kinematic link and pair.
2. What is Coriolis component ? Explain.
3. State the laws of friction.
4. Write a note on belt drives. Why are they preferred over gear drives?
5. What is eccentric motion? Where is this used?
6. Why are special contour cams used?
7. Write a not on the law of gearing
8. Distinguish between compound, reverted and epicyclic gear trains.
9. Where flywheels used ? What is their functions?
10. Write a note on balancing of rotating masses.

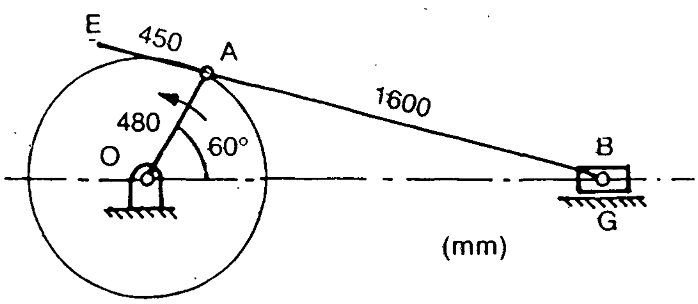
Part – B (5 x 16 = 80 marks)

11. A single plate clutch transmits 25 kW at 900 rpm. The maximum pressure intensity between the plates is 85 kN/m^2 . The outer diameter of the plate is 360 mm. Both sides of the plate are effective and the coefficient of friction is 0.25. Determine
    (i) the inner diameter of the plate
    (ii) the axial force to engage the clutch

12a). In a four-link mechanism, the dimensions of the links are as under:
AB = 50 mm, BC = 66 mm, CD = 56 mm and AD = 100 mm
At the instant when ∠DAB = 60°, the link AB has an angular velocity of 10.5 rad/s in the counter-clockwise direction. Determine
(i) the velocity of point C
(ii) the velocity of point E on the link BC when BE = 40 mm
(iii) the angular velocities of the links BC and CD
(iv) the velocity of an offset point F on the link BC if BF = 45 mm, CF = 30 mm and BCF is read clockwise
(v) the velocity of an offset point G on the link CD if CG = 24 mm, DG = 44 mm and DCG is read clockwise
(vi) the velocities of rubbing at pins A, B, C and D. The radii of the pins are 30, 40,25 and 35 mm respectively.

(OR)

12b). For the configuration of a slider-crank mechanism shown in Fig., calculate
(i) The acceleration of the slider at B
(ii) The acceleration of 6 point E
(iii) The acceleration of link AB.
OA rotates at 20 rad/s counter-clockwise.



13a). Draw the profile of a cam operating a knife-edged follower having a lift of 30 mm. The can raises the follower with SHM for 150° of its rotation followed by a period of dwell for 60°. The follower descends for the next 100° rotation of the cam with uniform velocity, again followed by a dwell period. The cam rotates at a uniform velocity of 120 rpm and has a least radius of 20 mm. What will be the maximum velocity and acceleration of the follower during the lift and the return?

(OR)

13b). A tangent cam with a base circle diameter of 50 mm operates a roller follower 20 mm in diameter. The line of stroke of the roller follower passes through the axis of the cam. The angle between the tangential faces of the cam is 60°,speed of the cam shaft 200 rpm and the lift of the follower 15 mm. Calculate

(i) the main dimensions of the cam

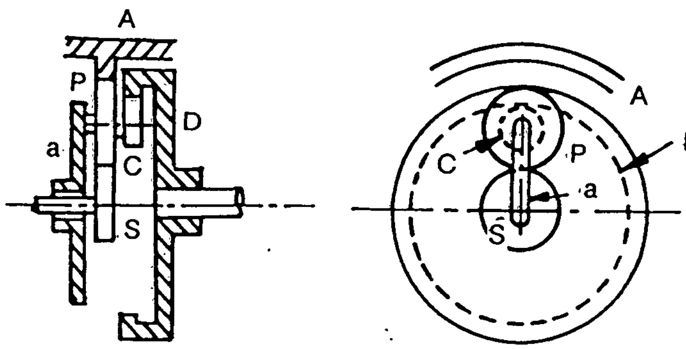
(ii) the accelerations of the follower at

(a) the beginning of lift

(b) where the roller just touches the nose

(c) the apex of the circular nose.

14a). In a reduction gear shown in Fig. , the input S has 24 teeth. P and C constitute a compound planet having 30 and 18 teeth respectively. If all the gears are of the same pitch, find the ration of the reduction gear. Assume A to be fixed.



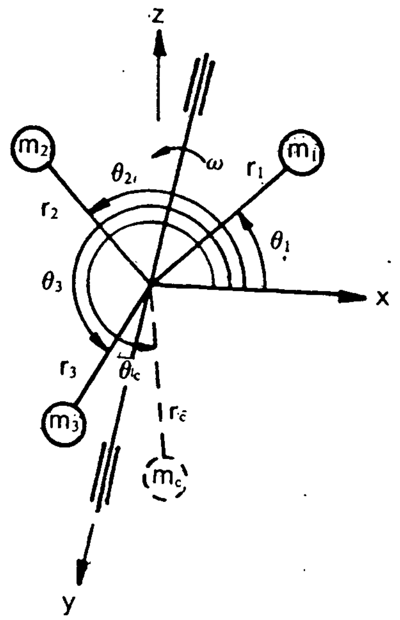
(OR)

14b). The number of teeth of a spur gear is 30 and it rotates at 200 rpm. What will be its circular pitch and the pitch line velocity if it has a module of 2 mm ?

15a). Figure shows a rotor having the following properties.

$m_1 = 4$ kg	$r_1 = 75$ mm	$\theta_1 = 45°$
$m_2 = 3$ kg	$r_2 = 85$ mm	$\theta_2 = 135°$
$m_3 = 2.5$ kg	$r_3 = 50$ mm	$\theta_3 = 240°$

Determine the amount of the countermass at a radial distance of 75 mm required for the static balance.



[OR]

15b). Figures shows a rotor having the following properties:

$m_1 = 4$ kg $\quad r_1 = 75$ mm $\quad \theta_1 = 45°$ $\quad r_{c1} = 75$ mm

$m_2 = 3$ kg $\quad r_2 = 85$ mm $\quad \theta_2 = 135°$ $\quad r_{c2} = 40$ mm

$m_3 = 2.5$ kg $\quad r_3 = 50$ mm $\quad \theta_3 = 240°$