

ANNA UNIVERSITY OF TECHNOLOGY, COIMBATORE
B.E. / B.TECH DEGREE EXAMINATIONS : NOV / DEC 2010
REGULATIONS : 2008
THIRD SEMESTER - MECHANICAL ENGINEERING
080120010 - KINEMATICS OF MACHINERY

TIME: 3 HOURS

MAX. MARKS: 100

Sketches should be drawn neatly
 Give brief procedure for graphical constructions
 Use A3 size drawing sheet both sides
 Assume any suitable data, if missing

PART - A

(20 x 2 = 40 Marks)

ANSWER ALL QUESTIONS

1. What are the three conditions to be fulfilled obtain a four bar crank rocker mechanism?
2. Define inversion of kinematic chain.
3. What is the condition to be met for correct steering?
4. State the purpose of indexing mechanism.
5. List out the inversions of double slider crank mechanism.
6. Define the rubbing velocity.
7. What is a configuration diagram? What is its use?
8. Define coriolis component of acceleration.
9. What is the prime circle of a cam?
10. List the motions of the follower, during its travel.
11. Why are sometimes the axes of translating roller followers in cam follower mechanisms offset from the axis of cam rotating?
12. Define tangential cam.
13. State the law of gearing.

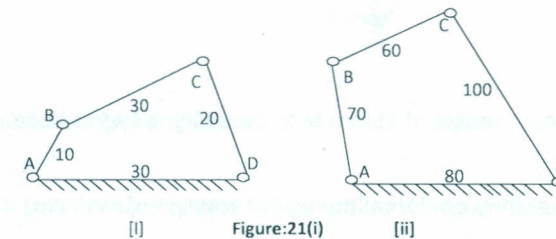
14. What is the difference between a simple gear train and a compound gear train?
15. What is interference in involute gear and how is it prevented?
16. What is a differential gear of an automobile?
17. Write the equation of frictional torque for uniform pressure and uniform wear theories for a flat collar.
18. What is the condition to be fulfilled for obtaining maximum efficiency of a screw jack?
19. State the functional difference between a clutch and a brake.
20. What are the advantages of wire ropes over fabric ropes?

PART - B

(5 x 12 = 60 Marks)

ANSWER ANY FIVE QUESTIONS

- 21.(i) Find the maximum and minimum transmission angle of the four-bar mechanism shown in figure 21(i). The figure indicates the dimensions in standard unit length. (2 x 3 = 6)



- (ii) Write the aid if a neat sketch, explain the Ratchet and Escapism mechanism. (6)

22. The dimensions of a four bar mechanism ABCD is as follows: crank AB=300mm, coupler BC=360mm, follower CD=360mm and fixed link AD=600mm. The angle DAB=60°. The crank has angular velocity of 10rad/s and angular acceleration of 30rad/s², both clockwise. Determine the angular velocity and angular acceleration of DC & BC and the velocity and acceleration of the joint C.

23. In mechanism as shown in figure 23, the crank OA rotates at 20rpm anticlockwise direction and gives motion to the sliding blocks B and D. The dimensions of various links are OA=300mm, AB=1200mm, BC=450mm and CD=450mm. For the given configuration, determine:

- 1) velocities of sliding at B and D,
- 2) angular velocity of CD,
- 3) linear acceleration of D,
- 4) angular acceleration of CD.

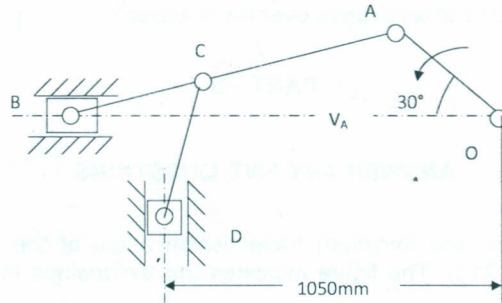


Figure: 23

24. A cam with a minimum radius of 25mm is to be designed for a knife edge follower with the following data:

- to raise the follower through 35mm during 60° rotation of the cam,
- dwell for next 40° of the cam rotation,
- descending of the follower during the next 90° of the cam rotation,
- Dwell during the rest of the cam rotation.

Draw the profile of the cam if the ascending and descending of the cam is with simple harmonic motion and the line of stroke of the follower is offset 10mm from the axis of the cam shaft.

What is the maximum velocity and acceleration of the follower during the ascent and the descent if cam rotates at 150rpm?

25. Two gear wheels mesh externally to obtain a velocity ratio of 3 to 1. The involute teeth has 6mm module and 20° pressure angle. Addendum is equal to one module. The pinion rotates at 90rpm. Determine:

- i) Number of teeth on pinion to avoid interference and the corresponding number on the wheel.
- ii) The length of path and arc of contact
- iii) Contact ratio and
- iv) the maximum velocity of sliding.

26. In a reverted epicyclic gear train, the arm A carries two gears S_1 and S_2 and a compound gear $P_1 - P_2$. The gear S_1 meshes with gear P_2 and the gear S_2 meshes with gear P_1 . The numbers of teeth on S_1 , S_2 and P_2 are 75, 30 and 90 respectively. Find the speed and direction of gear S_2 when gear S_1 is fixed and arm A makes 100 rpm counter clockwise.

27. (i) A single plate clutch, with both sides effective, has outer and inner diameters 300mm and 200mm respectively. The maximum intensity of pressure at any point in the contact surface is not to exceed 0.1 N/mm². If the coefficient of friction is 0.3, determine the power transmitted by a clutch at a speed 2500rpm for uniform pressure and for uniform wear. (8)

- (ii) The following data are related to a screw jack;
- Pitch of the thread screw=8mm,
 - Diameter of the screw thread =40mm,
 - Coefficient of friction between screw and nut =0.1, load=20kN.
- Assuming that the load rotates with screw, determine:
- 1) the ratio of torques required to raise and lower the load,
 - 2) the efficiency of the machine. (4)

28. An open belt drive connects two pulleys 1.2m and 0.5m diameter, on parallel shafts 4m apart. The mass of the belt is 0.9 kg per length and the maximum tension is not to exceed 2000N. The coefficient of friction is 0.3. The 1.2m pulley, which is the driver, runs at 200rpm. Due to belt slip on one of the pulleys, the velocity of the driven shaft is only 450rpm. Calculate the torque on each of the two shafts, the power transmitted, and power lost in friction. What is the efficiency of the drive?

*****THE END*****