

Subject Name: MD1
Subject Code: ME404
ASSIGNMENT
D.O.S: 27th Apr. without fail

1. Draw with neat sketches the inversions of double slider crank chain. What are their applications?
2. The dimensions and configuration of a four-bar mechanism shown in figure-1 are as follows:
AB=300mm, DC=360mm, BC=360mm and AD=600mm. The angle BAD is 60 degree. The crank AB has an angular velocity of 10 rad/s and angular acceleration of 30 rad/second square, both clockwise. Determine angular velocities and angular accelerations of DC and BC and velocity and acceleration of point C.
3. Derive an expression for ratio of tensions on two sides of a V-belt drive when the belt is about to slip.
4. A small generator driven by means of a V-belt which has a total angle of 60 degree between the faces of V. The angle of lap is 120 degree and the mean radius of the belt as it passes round the pulley is 50mm. If coefficient of friction is 0.2 and mass of the belt is 0.45 kg/m. Find the tension in each side of the belt when 750W is being transmitted at a pulley speed of 1800 r.p.m.
4. Explain working principle of the Valve mechanism in 4-stroke IC engines.
5. Draw the cam profile for a knife edge follower with the following data:
 - (i) Cam lift =40 mm during 90 degree of cam rotation with S.H.M.
 - (ii) Dwell for next 30 degree
 - (iii) During the next 60 degree of cam rotation, the follower returns to its original position with S.H.M.
 - (iv) Dwell during the remaining 180 degree.The radius of the base circle of cam is 40 mm. Determine the maximum velocity and acceleration of the follower during its ascent and descent, if the cam rotates at 240 rpm.
6. Explain the working principle of rope break dynamometer with neat sketch.
7. The diameter of the brake drum of a single block brake is shown in

is 1 meter. It sustains 240N.m of torque at 400 rpm. The coefficient of friction is 0.32. Determine the required force to be applied when the rotation of drum is (a) clockwise (b) counter-clockwise and the angle of contact is 35 degree and 100 degree. Given that $a=800\text{mm}$ $b=150\text{mm}$ and $c=25\text{mm}$. Also find the new values of 'c' for self-locking of the brake.

8. Derive an expression for torque required on a flat collar bearing considering uniform wear theory.
9. A car engine rated at 9 kW gives a maximum torque of 88 N-m. The clutch is of single plate type both sides of plate being effective. If the coefficient of friction 0.3, the mean axial pressure is 8 N/cm square and external radius of friction surface is 1.25 times the internal radius, find the dimensions of the clutch plate and total axial pressure that must be exerted by the springs.
10. Deduce the frictional torque expression for conical collar bearing by using uniform pressure and uniform wear theory.
11. The thrust of a propeller shaft in a marine engine is taken up by a no. of collar with the shaft which is 50 cm in diameter. The thrust on the shaft is 180kN and the speed is 92 r.p.m. Taking coefficient of friction equal to 0.04 and assuming intensity of pressure as uniform 2.8MPa. Find the external diameter of the collar and the no. of collars required. If the power lost in the friction is not exceed 16kW.
12. What do you mean by inversion of mechanism? Discuss the inversions obtained in a slider crank mechanism by fixing the crank and explain the crank slotted lever quick return mechanism with the help of neat sketch.
13. The distance between the parallel shafts is 20 mm and they are connected by an oldham's coupling. The driving shaft revolves at 260 r.p.m. what will be the maximum speed of sliding of the tongue of the intermediate piece along its groove.

14. State and prove Arnold Kennedy's theorem.
15. Write down the steps to find out the angular velocities of different links in four bar mechanism by 'I' centre method or relative velocity method, assuming one link is fixed and the crank is rotating with angular velocity ω .
16. Write the steps to draw the acceleration polygon of a slider crank mechanism. Also define Klein's construction and Coriolis acceleration.
17. Deduce expression for the exact and approximate length of the belt in a cross belt and open belt drive.
18. The smaller pulley of flat belt drive has radius of 230 mm and rotates at 450 r.p.m. The angle of lap is 135° . The initial tension in the belt is 1.4 kN and the co-efficient of friction between the belt and the pulley is 0.2. Determine the power transmitted by the belt.
19. Discuss the construction and limitation of following dynamo meters:
 - a. Rope Brake and b.
20. A band and block brake has 15 blocks and each block subtends an angle of 25° at the centre of the wheel. The two ends of the band are fixed to the pins on the opposite side of the fulcrum at distances of 30 mm and 220 mm from it. Determine the maximum force required to be applied on the lever at a distance of 320 mm from the fulcrum to absorb 280 kW of power at 250 r.p.m. the effective diameter of the drum is 820 mm. Take $\mu=0.32$.
21. Draw the profile of a cam operating a knife-edge follower having a lift of 40 mm. The cam raises the follower with SHM for 120° of the rotation followed by a period of dwell for 60° . The follower descends for the next 120° rotation of the cam with uniform velocity again followed by a dwell period. The cam rotates at a uniform

velocity of 130 rpm and has a least radius of 22 mm. What will be the maximum velocity and acceleration of the follower during the lift and the return?