Roll No. | | | | | | | | | | |

B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2019

Mechanical Engineering

Semester 3

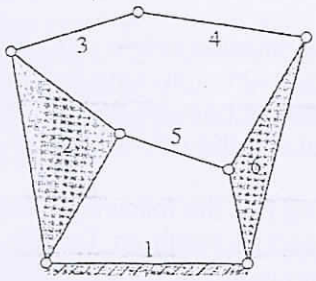
ME8302 KINEMATICS OF MACHINES

(Regulation 2012)

Time : 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. Determine no of dof for the kinematic chain shown below?



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2. Classify Kinematic pairs according to the type of contact between the elements?
3. Explain Kinematics and kinetics?
4. How Velocity analysis is done using instantaneous centre method
5. What are the different types of cam and follower?
6. Define the following in cams : i. pitch point ii. Pressure angle
7. Differentiate between cycloid and involute profile?
8. What do you understand by the term 'interference' as applied to gears
9. Explain sliding and rolling friction?
10. Explain the phenomena of 'slip' and 'creep' in a belt drive?

Part – B (5 x 16 = 80 marks)

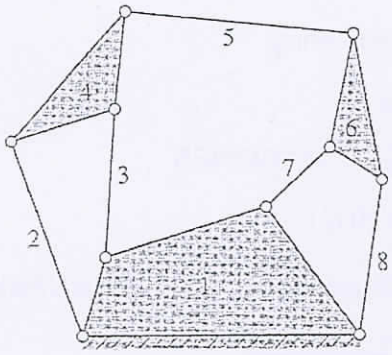
11. A cam is to be designed for a knife edge follower with the following data :
1. Cam lift = 40 mm during 90° of cam rotation with simple harmonic motion.
2. Dwell for the next 30°.3. During the next 60° of cam rotation, the follower returns to its original position with simple harmonic motion.4. Dwell during the remaining 180°.
Draw the profile of the cam when the line of stroke of the follower passes through the axis of the cam shaft, and the radius of the base circle of the cam is 40 mm.

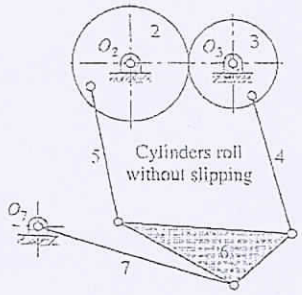
12. a) a. Explain the following :

i. lower and higher pairs with examples (4 marks)

ii. Kutzbach criterion for planar mechanism (4 marks)

iii. Find the mobility of each mechanism shown in the fig 1 and 2 (8 marks)



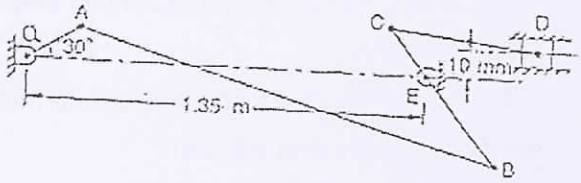


(OR)

b) (i) Explain any one quick return motion mechanism (8 marks)

(ii) In a crank and slotted lever quick return motion mechanism, the distance between the fixed centers is 240mm and the length of the driving crank is 120mm. Find the inclination of the slotted bar with the vertical in the extreme position and the time ratio of cutting stroke to the return stroke. (8 marks)

13. a) A mechanism as shown in fig has the following dimensions: OA=200mm; AB=1.5m; BC=600mm; CD=500mm and BE=400mm. Locate all the instantaneous centers. If the crank OA rotates uniformly at 120 rpm clockwise, Find (1) the velocity of B, C, and D (2) the angular velocity of the links AB, BC and CD.



(OR)

b) In the mechanism shown in Fig, the slider C is moving to the right with a velocity of 1 m/s and an acceleration of 2.5 m/s². The dimensions of various links are AB = 3 m inclined at 45° with the vertical and BC = 1.5 m inclined at 45° with the horizontal. Determine: 1. The magnitude of vertical and horizontal component of the acceleration of the point B, and 2. the angular acceleration of the links AB and BC.

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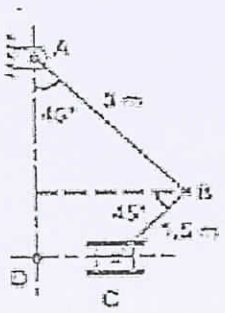

14. a) Two involute gears of 20° pressure angle are in mesh. The number of teeth on pinion is 20 and the gear ratio is 2. If the pitch expressed in module is 5 mm and the pitch line speed is 1.2 m/s, assuming addendum as standard and equal to one module, find: 1. The angle turned through by pinion when one pair of teeth is in mesh; and 2. The maximum velocity of sliding.

(OR)

b) In an epicyclic gear train, the internal wheels A and B and compound wheels C and D rotate independently about axis O. The wheels E and F rotate on pins fixed to the arm G. E gears with A and C and F gears with B and D. All the wheels have the same module and the number of teeth are : $T_C = 28$; $T_D = 26$; $T_E = T_F = 18$.
1. Sketch the arrangement ; 2. Find the number of teeth on A and B ; 3. If the arm G makes 100 r.p.m. clockwise and A is fixed, find the speed of B ; and 4. If the arm G makes 100 r.p.m. clockwise and wheel A makes 10 r.p.m. counter clockwise ; find the speed of wheel B

15. a) The contact surfaces in cone clutch have an effective diameter of 75 mm . The semi-cone angle is 15 ° and coefficient of friction is 0.3 . An axial force of 180 N is employed and this clutch is used to connect an electric motor running uniformly at 1000 rpm with a flywheel which is initially at rest. The flywheel has a mass of 13.5 kg and radius of gyration of 150 mm. Calculate (i). torque required to produce slipping (ii). Time taken by the flywheel to attain full speed (iii). Energy lost during slipping

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(OR)

b) (i) A 150mm diameter valve, against which a steam pressure of $2MN/m^2$ is acting, is closed by means of a square threaded screw 50mm in external diameter with 6mm pitch. If the coefficient of friction is 0.12; find the torque required to turn the handle (6 marks)

(ii) A shaft rotating at 250 rpm is driven by another shaft at 500 rpm and transmits 5 k W through a belt drive. The belt is 100 mm wide and 10 mm thick and mass of the belt is 1000 kg / m^3 .The distance between the shaft is 3 m and diameter of the smaller pulley is 300 mm. Calculate the maximum stress in the belt for Cross belt drive . Take coefficient of friction as 0.3. (10 marks)

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