B.E. (Aeronautical Engineering) Fourth Semester (C.B.S.)

Mechanics of Machines Paper - I

P. Pages : 3 **TKN/KS/16/7401**

Time : Three Hours * 0 4 8 1 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Diagrams and chemical equations should be given whenever necessary.
11. Illustrate your answers whenever necessary with the help of neat sketches.

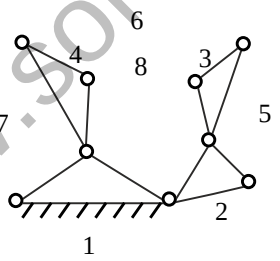
1. i) Define: **3**

a) Kinematic link. b) Kinematic Pair.
c) Kinematic chain.

ii) Distinguish between **6**

a) Mechanism and machine. b) Kinematics and dynamics.

iii) What do you mean by degree of freedom of a kinematic pair ? **5**
Calculate the degree of freedom of the kinematic linkage which shown below

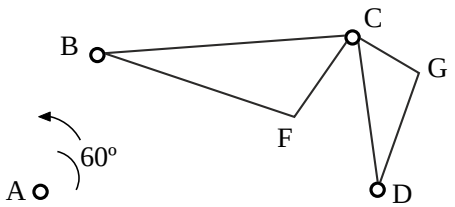


OR

2. i) Describe briefly about the four bar mechanism. Discuss its types with neat sketch. **10**

ii) Explain parallel. Crank four bar mechanism with neat diagram. **4**

3. In a four-link mechanism, the dimensions of the link are as under : AB=50mm, BC=66mm, CD=56mm and AD=100mm. At the instant when $\angle DAB = 60^{o}$, the link AB has an angular velocity of 10.5rad/s in the counter-clockwise direction. Determine.



(a)

i) The velocity of link AB. **2**

ii) The velocity of point E on the link BC when BE=40mm **3**

iii) The angular velocity of the links BC and CD. **3**

iv) The velocity of an offset point F on the link BC if BF=45mm, CF=30mm and ∠BCF is read clockwise. **3**

v) The velocity of an offset point G on the link CD if CG=24mm, DG=44mm and DCG is read clockwise. **3**

OR

4. Explain the motion of a slider on a rotating link and find out the coriolis acceleration component. **14**

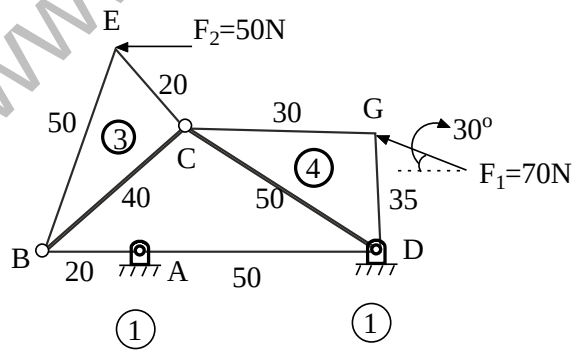
5. i) What is a cam ? How are the cams classified ? Describe in detail. **7**

ii) What is a displacement diagram ? Why is it necessary to draw it before drawing a cam profile. **6**

OR

6. Draw the profile of a cam operating a knife edge follower having a lift of 30mm. The cam raises the follower with SHM for 150° of the 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 120rpm and has a least radius of 20mm. What will be the maximum velocity and acc^{n} of the follower during the lift and the return ? **13**

7. For the static equilibrium of the mechanism of the fig given below. Find the torque to be applied on link AB. **13**



all dimensions are in (mm).

OR

8. i) What do you mean by applied and constraint forces ? Explain. **4**

ii) What are free body diagrams of a mechanism ? How are they helpful in finding the various forces acting on the various members of the mechanism. **5**

iii) What is the principle of virtual work ? Explain. **4**

9. What do you mean by gyroscopic couple ? Explain Derive a relation for a magnitude. **13**

OR

10. Each wheel of a four -wheeled, rear engine automobile has a moment of inertia of 2.4 kgm^2 and effective diameter of 660mm. The rotating parts of the engine have a moment of Inertia of 1.2 $kg.m^2$. The gear ratio of engine to the back wheel is 3 to 1. The engine axis is parallel to the rear axle and the crankshaft rotates in the same sense as the road wheels. The mass of the vehicle is 2200Kg and the centre of mass is 550mm above and the road level. The track width of the vehicle is 1.5m. Determine the limiting speed of the vehicle around a curve with 80m radius so that all the four wheels maintain contact with the road surface. **13**

11. Each crank and the connecting rod of a six-cylinder four stroke in line engine are 60mm and 240mm respectively. The pitch distances between the cylinder centre lines are 80mm, 80mm, 100mm, 80mm and 80mm respectively. The reciprocating mass of each cylinder is 1.4kg. The engine speed is 1000 rpm. Determine the out of balance primary and secondary forces and couples on the engine if the firing order be 142635 Take a plane midway between the cylinders 3 and 4 as reference plane. **13**

OR

12. What do you mean by balancing machines? Describe any one type of a static balancing machine. **13**

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