B. Mechanical Engineering (Evening) 1st Year 1st Semester
Supplementary Examination, 2017

Engineering Mechanics-III

Time: 3 Hours **Full Marks: 100**

(Answer any eight questions)

(Assume missing data, if there is any, suitably justifying required assumptions)

1. The right angle bar rotates counterclockwise with an angular velocity which is decreasing at the rate of 5 rad/sec^2. Write the vector expressions for the velocity and acceleration of point *A* when angular velocity is 3 rad/sec. See Fig. 1 (12.5)

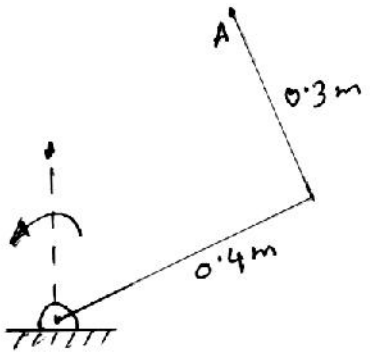


Fig. 1

2. Arm *OB* of the linkage has a clockwise angular velocity of 10 rad/sec in the position shown where $\alpha=45^0$. Determine the velocity of *A*, of *D*, and the angular velocity of link *AB* for the position shown in Fig. 2. (12.5)

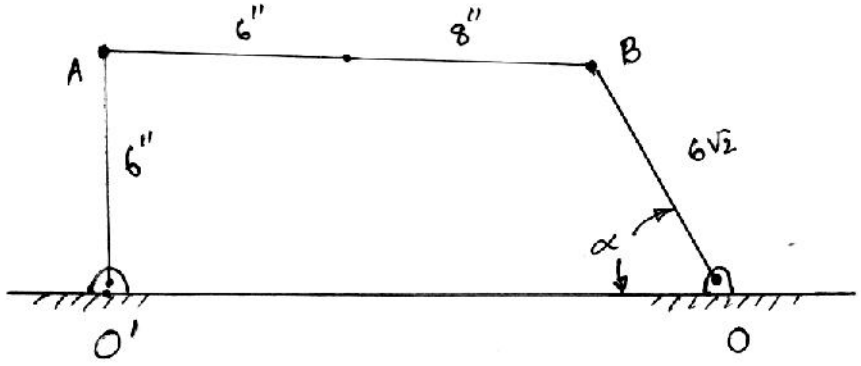


Fig. 2

3. The T-shaped body rotates about a horizontal axis through the point *O*. At the instant represented, its angular velocity is ω= 3red/sec and its angular acceleration is α= 14 rad/sec^2 in the directions indicated. Determine the velocity and acceleration of (a) point *A* and (b) point *B*. Please refer Fig. 3. (12.5)

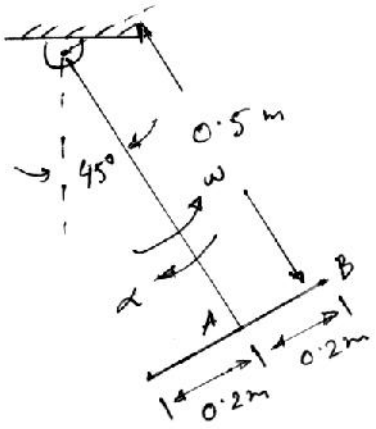


Fig. 3

4. Find out the expression of acceleration of a point of a rigid body rotating about a fixed axis. Please refer Fig. 4. (12.5)

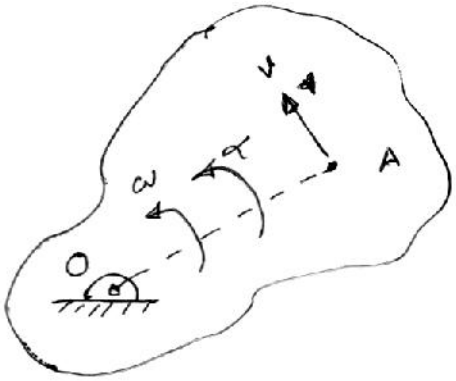


Fig- 4

5. Point *A* is given a constant acceleration *a* to the right starting from rest with x essentially zero. Determine the angular velocity ω of the link *AB* in terms of *x* and *a*. Please see Fig. 5. (12.5)

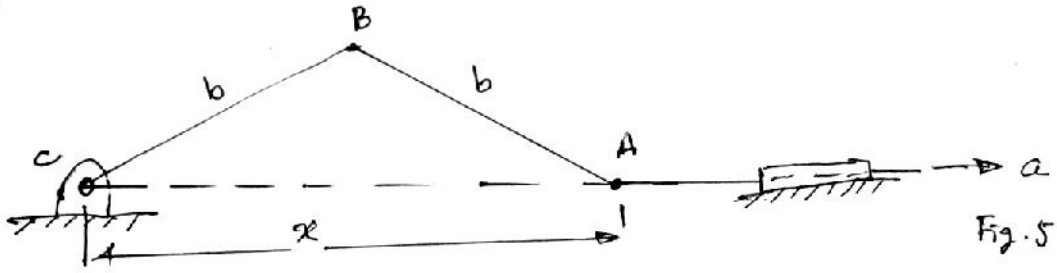


Fig. 5

6. Using the approach of rigid-body kinematics, deduce the vector form of relative velocity considering any tow points on the same rigid body. (12.5)

7. A circular disk rolls without slipping with a clockwise angular velocity w= 4 rad/sec. For the instant represented, write the vector expressions for the velocity of A with respect to B and the velocity of P. Please refer Fig. 6. (12.5)

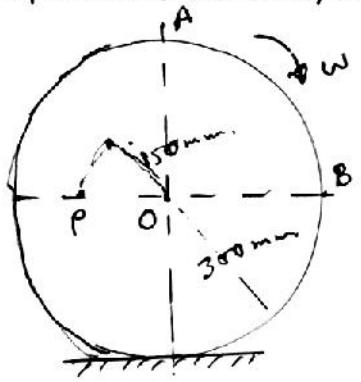


Fig. 6

8. Calculate the shear V_B and the bending moment M_B at the section just to the left of the wall at B, for the cantilever beam shown in Fig. 7. (12.5)

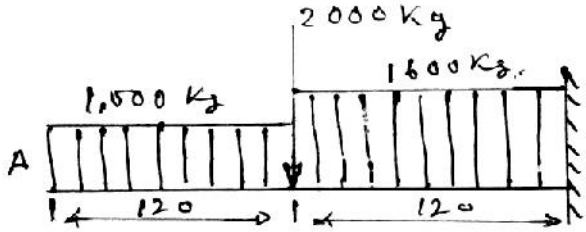
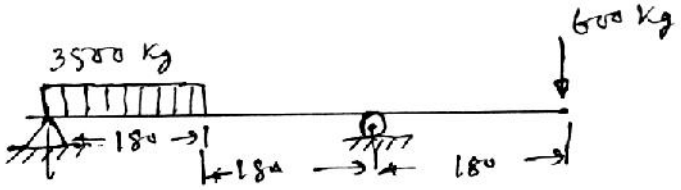


Fig - 7

9. Please refer to Fig. 8. Construct, to scale, the complete shear force and bending moment diagrams. (12.5)



10. With reference to the coordinate axes x and y as shown in Fig. 9, drive the equation defining the deflection curve of a uniformly loaded cantilever beam. From this evaluate the deflection σ at the free end. (12.5)