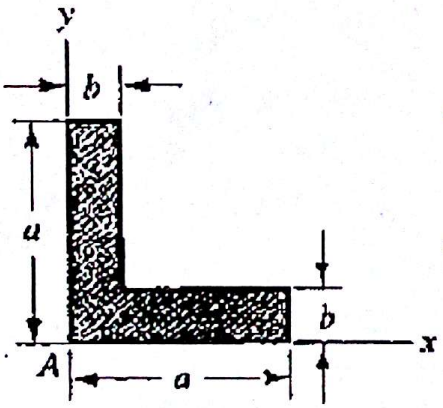
Department of Applied Mechanics
ENGINEERING MECHANICS (AML-110)
Semester-II: Session (2012-2013)
Minor - II

Time: 1 hr Max. Marks: 40

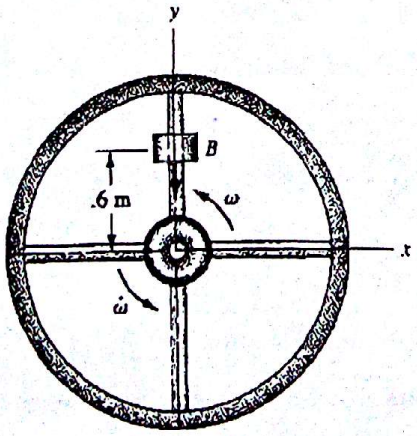
Note: Answer all four questions. All questions carry equal marks.

Q1) Find the direction of the principal axes for the angle section at point *A*. Also find the maximum and minimum value of second moment of area at A.
Given a.= 0.4 m and b = 0.1 m



$\alpha = 45^\circ, 135^\circ$
1.458×10^{-3}
3.008×10^{-3}

Q2) A wheel is rotating at time *t* with an angular speed ω of 5 rad/sec. At this instant, the wheel also has a rate of change of angular speed of 2 rad/sec^2. A body *B* is moving along a spoke at this instant with a speed of 3 m/sec relative to the spoke and is increasing in its speed at the rate of 1.6 m/sec^2. These data are given when the spoke, on which *B* is moving, is vertical and when *B* is 0.6 m fro the center of the wheel, as shown in the diagram. What are the velocity and acceleration of *B* at this instant relative to the fixed reference *xyz*?

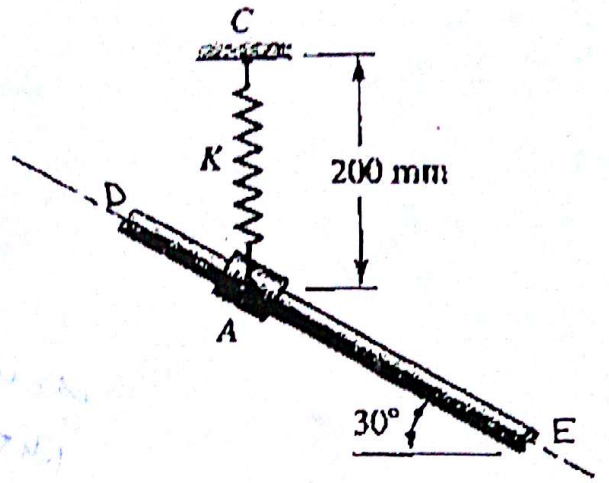


$-3\hat{\epsilon}_r + 3\hat{\epsilon}_\theta$

$-16.6\,\hat{\epsilon}_r - 28.8\,\hat{\epsilon}_\theta$

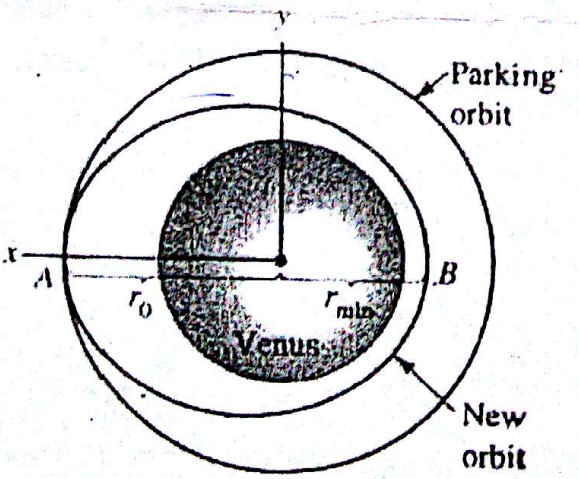
P.T.O.

Q3) A collar A having a mass of 5 kg can slide without friction on a pipe. If released from rest at the position shown, where the spring is unstreatched, what speed will the collar have after moving 50 mm? The spring constant is 2,000 N/m. Pipe is rigid and fixed at both the ends D and E.



0.38 m/s

Q4) A space vehicle is in a circular "parking" orbit around the planet Venus, 320 km above the surface of this planet. The radius of Venus is 6,160 km, and the escape velocity at the surface is 1.026×10^4 m/sec. A retro-rocket is fired to slow the vehicle so that it will come within 32 km of the planet. If we consider that the rocket changes the speed of the vehicle over a comparatively short distance of its travel, what is this change of speed? What is this speed of the vehicle at its closest position to the surface of Venus?



7.4×10^9

0.848-1.225