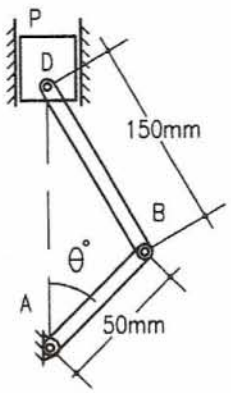
2.0 hours open book Exam.

- Solve on the answer booklet.
- Write clearly. Clarity is important in grading.
- Vectors are indicated in bold.
- Take g=9.81 m/s^2 or g=32.2 ft/s^2.

No.1– (25%)

Crank AB rotates about point A with a constant angular velocity of 95 rad/s clockwise



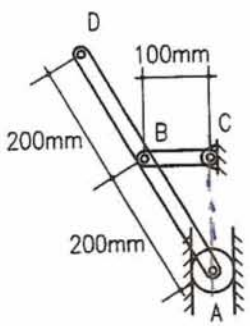
5% 1- Draw the kinematic diagrams of velocity and acceleration of member BD when θ=60°.

10% 2- Determine the angular velocity of member BD when θ=60°.

10% 3- Determine the acceleration of piston P when θ=60°.

No.2– (25%)

The 4 kg uniform rod ABD is ~~attached~~ pin Connected to the crank BC and is fitted with a small wheel at A that can roll without friction along a vertical slot. At the instant shown crank BC rotates with an angular velocity of 6 rad/s clockwise and an angular acceleration of 15 rad/s^2 counterclockwise.



5% 1- Draw the kinematic diagrams of velocity & acc. of the rod ABD and the crank BC separately, for the position shown.

10% 2- Determine the angular acceleration of rod ABD for the position shown.

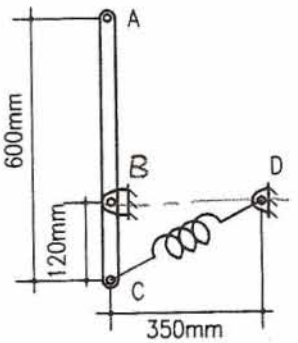
5% 3- Draw the free body diagrams and the kinetic diagrams of rod ABD for the position shown.

5% 4- Determine the reaction at roller A.

No.3– (25%)

ABC

A slender 4 kg rod can rotate in a vertical plane about a pivot at B. A spring of constant k=400 N/m and of unstretched length of 150 mm is attached to the rod as shown. The rod is released from rest in the position shown and rotates through 90°.



5% 1- Draw the initial and the final free body diagrams of the rod.

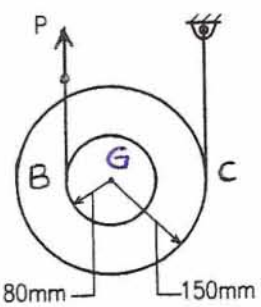
5% 2- Determine the work of the spring force for the motion.

5% 3- Determine the work of the weight for the motion.

10% 4- Determine the angular velocity of the rod after it has rotated through 90°.

No.4– (25%)

The double pulley shown has a mass of 3 kg and a radius of gyration about G of 0.1m. When the pulley is at rest, a vertical force P of magnitude 24 N is applied to cord B and sets the pulley in motion.



10% 1- Draw the impulse and momentum diagrams of the pulley.

10% 2- Determine the velocity of the center of the pulley after 1.5 seconds.

5% 3- Determine the tension in the cord C.