

Exam "Methods of Navigation" 12.05.2004

(Function calculator)

1. Explain
 - (a) Dirac's delta function $\delta(t)$
 - (b) The Schuler pendulum
 - (c) The Sagnac phenomenon and the ring laser

2. In a Church, there is a long lamp (chandelier) hanging from the roof. It is swinging slowly in both directions.
 - (a) Write up the *state vector* of this system. How many elements does it contain?
 - (b) Write the *dynamical model* of the system as a system of first order differential equations. Let the length of the lamp be ℓ , gravity g . (You may assume, that the deviations from the position of rest are small.)
 - (c) A reflector is attached to the lamp. A tacheometer, on the same level as the lamp, measures the distance to it (you may assume the distance lamp – tacheometer to be large).
Write the *observational model*.

3. Explain
 - (a) The Kepler orbital elements (drawing!)
 - (b) A strapdown inertial device.

4. (a) There will be five types of service available from the European satellite +navigation system GALILEO, please list them all.
(b) What is SBAS? Explain briefly how it works.

Points:

Question	1 a b c	2 a b c	3 a b	4 a b	Yht.
Points	6 2 2 2	6 2 2 2	6 3 3	7 3 4	25

Points	10	13	16	19	23
Grade	1	2	3	4	5