2 - DDLWGLLCMMZPY9U

0406186522

FÖRSÄTTSBLAD TENTAMEN/ EXAMINATION COVER

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MARKERA MED "X"/
MARK WITH "X" ☒

IFYLLES AV STUDENT OCH TENTAMENSVAKT/
TO BE FILLED IN BY THE STUDENT AND THE INVIGILATOR:

KURSKOD / COURSE CODE: A G 1 8 1 7	EFTERNAMN / FAMILY NAME
KURSNAMN / COURSE NAME: Kartprojektioner och referenssystem	
PROVKOD / TEST CODE: T E N 1	
TENTAMENSDATUM / EXAMINATION DATE (Y/Y/Y/Y - M/M - D/D): 2019 - 04 - 18	

PROGRAMKOD / PROGRAM CODE:	INLÄMNINGSTID / TIME SUBMITTED:	SIGNATUR TENTAMENSVAKT / SIGNATURE INVIGILATOR:	ANTAL BLAD / NO OF SHEETS:
CSAMH3	15.28		04

MARKERA BEHANDLADE UPPGIFTER MED "X "OCH EJ BEHANDLADE UPPGIFTER MED "-" /
MARK WITH "X" PROBLEMS SOLVED. MARK WITH "-" PROBLEMS NOT ATTEMPTED

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
X	X	X																	

IFYLLES AV INSTITUTIONEN / TO BE FILLED IN BY THE DEPARTMENT:

BEDÖMNING / ASSESSMENT

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	5.5	6.5																	

BONUSPOÄNG/ BONUS POINTS: 00,0

SLUTSUMMA / FINAL POINTS: 13,0

BETYG/ GRADE: D

Godkänns av examinator / approved by Examiner.....

Family name, first name	Personal Registration Number	Programme	Sheet no. 1	Problem no. 1

1.a

$$e = \frac{\sqrt{a^2-b^2}}{a} \quad e' = \frac{\sqrt{a^2-b^2}}{b}$$ ✓ ✓

(1)

$$e^2 = \frac{a^2-b^2}{a^2} \Rightarrow a^2e^2 = a^2 - b^2 \Rightarrow b^2 = a^2 - a^2e^2$$

$$e'^2 = \frac{a^2-(a^2-a^2e^2)}{\underbrace{a^2-a^2e^2}_{b^2}} = \frac{a^2e^2}{a^2-a^2e^2} = \frac{e^2}{1-e^2} \Rightarrow e' = \frac{e}{\sqrt{1-e^2}}$$ ✓

1c Triangulations require multiple fixed points. From a geocentric perspective, points like the North Pole for example are constantly moving around. Hence celestial reference systems, where many fixed points are present, are better suited for triangulation purposes

fel

(0)

KTH VETENSKAP OCH KONST

| Family name, first name | Personal Registration Number | Programme | Sheet no. 2 | Problem no. 2 |

2a. UTM (Universal transerse Mercator)

Is a cylindrical projection based on ✓
the Gauss-Krueger mercator. ✓
It is divided into 60 zones along the
equator, each occupying 6° of the "globe"
It has a central meridian in Greenwitch fel ?
and a false easting of 500 km. ✓
It also applies a false Northing of 10 000 km, ✓
but only in the southern hemisphere.
It has a scale factor k=0,9996 ✓

(1.5)

2b. a) $x = -R\left(\frac{\pi}{2} - \bar{\phi}\right)\cos\lambda \qquad y = R\left(\frac{\pi}{2} - \bar{\phi}\right)\sin\lambda$

$e = R^2\left(\frac{\pi}{2} - 1\right)^2\cos^2\lambda + R^2\left(\frac{\pi}{2} - 1\right)^2\sin^2\lambda$ fel

$e = R^2\left(\frac{\pi}{2} - 1\right)^2\left(\cos^2\lambda + \sin^2\lambda\right) = R^2\left(\frac{\pi}{2} - 1\right)^2$

$f = -R\left(\frac{\pi}{2} - 1\right)\cos\lambda \cdot R\left(\frac{\pi}{2} - \bar{\phi}\right)\sin\lambda +$
$+ R\left(\frac{\pi}{2} - 1\right)\sin\lambda \cdot R\left(\frac{\pi}{2} - \bar{\phi}\right)\cos\lambda = 0$ ✓

$g = R^2\left(\frac{\pi}{2} - \bar{\phi}\right)^2\sin^2\lambda + R^2\left(\frac{\pi}{2} - \bar{\phi}\right)^2\cos^2\lambda$

$= R^2\left(\frac{\pi}{2} - \bar{\phi}\right)^2 \cdot \left(\sin^2\lambda + \cos^2\lambda\right) = R^2\left(\frac{\pi}{2} - \bar{\phi}\right)^2$ ✓

cont. next page

Family name, first name	Personal Registration Number	Programme	Sheet no. 3	Problem no. 2

2b cont

b) $h = \frac{\sqrt{E}}{R} = \frac{R(\frac{\pi}{2}-1)}{R} = \frac{\pi}{2} - 1$ fel

$k = \frac{\sqrt{S}}{R\cos(\phi)} = \frac{R(\frac{\pi}{2}-\phi)}{R\cos\phi} = \frac{\frac{\pi}{2}-\phi}{\cos\phi}$ ✓

c) $\theta' = \arccos\frac{f}{\sqrt{Eg}} = \arccos 0 \Rightarrow \theta' = 90°$ ✓

d) $\xi = \frac{\sqrt{Eg-f^2}}{R^2\cos\phi} = \frac{\sqrt{R^4(\frac{\pi}{2}-1)^2(\frac{\pi}{2}-\phi)^2}}{R^2\cos\phi} = \frac{(\frac{\pi}{2}-1)(\frac{\pi}{2}-\phi)}{\cos\phi}$ ✓ fel

e) conformal if $h = 1$, $h \neq 1$, not conformal

equivalent if $h \cdot k = 1$, $h \cdot k = \frac{(\frac{\pi}{2}-1)\cdot(\frac{\pi}{2}-\phi)}{\cos\phi} \neq 1$ ✓

not equivalent

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Family name, first name	Personal Registration Number	Programme	Sheet no. 4	Problem no. 3

3a. CIO (Conventional International Origin)

Is the mean position of the North Pole between 1900-1905. The position of the North Pole represents the Earth's rotational axis which is required to define a terrestrial reference system. The CIO serves as a fixed location of an, otherwise, constantly moving point.

2

3b. J2000.0 is a time epoch that represents January 1st 12:00 in the Julian calender. Because of the constant fluctuations of for example the North Pole, JD2000 is used as a time reference when defining the required parameters of a geodetic reference system.

0,5 ! ?

3c.

$(\phi, \lambda, h)_{SWEREF99} \xrightarrow{\text{WGS 84 ellipsoid}} (X, Y, Z)_{SWEREF99}$ ✓

$(X, Y, Z)_{SWEREF99} \xrightarrow[7 \text{ parameters}]{\text{Helmert trans}} (X, Y, Z)_{RT90}$ ✓

$(X, Y, Z)_{RT90} \xrightarrow{\text{Bessel 1841 ellipsoid}} (\phi, \lambda, h)_{RT90}$ ✓

$(\phi, \lambda, h)_{RT90} \xrightarrow{\text{Bessel 1841}} (\phi, \lambda)_{RT90} \xrightarrow{\text{Projection}} (X, Y)_{RT90}$ ✓

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