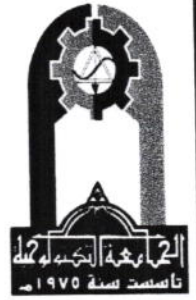




University Of Technology
Building and Construction Eng. Dept.
Final Exam - First Attempt- 2014-2015

Subject : Digital mapping
Branch : Geomatic engineering

Class: 2nd Class
Time: 3 hours
Date: / /2015



NOTE: Answer Four Questions only

Q1) (25 Marks)

- a) Find the cartographic accuracy of maps $\frac{1}{25000}$, $\frac{1}{50000}$, $\frac{1}{100000}$, $\frac{1}{200000}$, $\frac{1}{250000}$.
- b) Find the geodetic dimensions of maps $\frac{1}{250000}$, $\frac{1}{100000}$, $\frac{1}{50000}$, $\frac{1}{25000}$, $\frac{1}{500000}$, $\frac{1}{1000000}$.
- c) Find the number of maps which scales as follows $\frac{1}{500000}$, $\frac{1}{250000}$, $\frac{1}{100000}$, $\frac{1}{50000}$, $\frac{1}{25000}$, that contains in one map scale $\frac{1}{1000000}$.

Q2) (25 Marks)

- a) Draw U.T.M scale Factor distribution values at one zone.
- b) List the main differences between N and P images.
- c) List the main differences between contact and camera.
- d) what are the dimensions of UTM grid squares on map $\frac{1}{25000}$, $\frac{1}{50000}$, $\frac{1}{100000}$ (Draw the relationship between them).

Q3) (25 Marks)

- a) Draw the zones which pass through Iraq territory and sign all element at one zone.
- b) In topographic map below find the following: map scale, U.T.M grid coordinates of points (O,P,S), length of FR, contour interval on a map.
- c) Define: mirror reading, halftone-printing, offset, map, double linear scale.

Q4) (25 Marks)

- a) List methods of representation relief on maps and explain shading method.
- b) explain method of squares to compute the area of irregular shape on a map and give a numerical example.
- c) List methods of Transformation coordinate in a plane between two coordinate systems when the origin in both systems is fixed and draw each case.

Q5) (25 Marks)

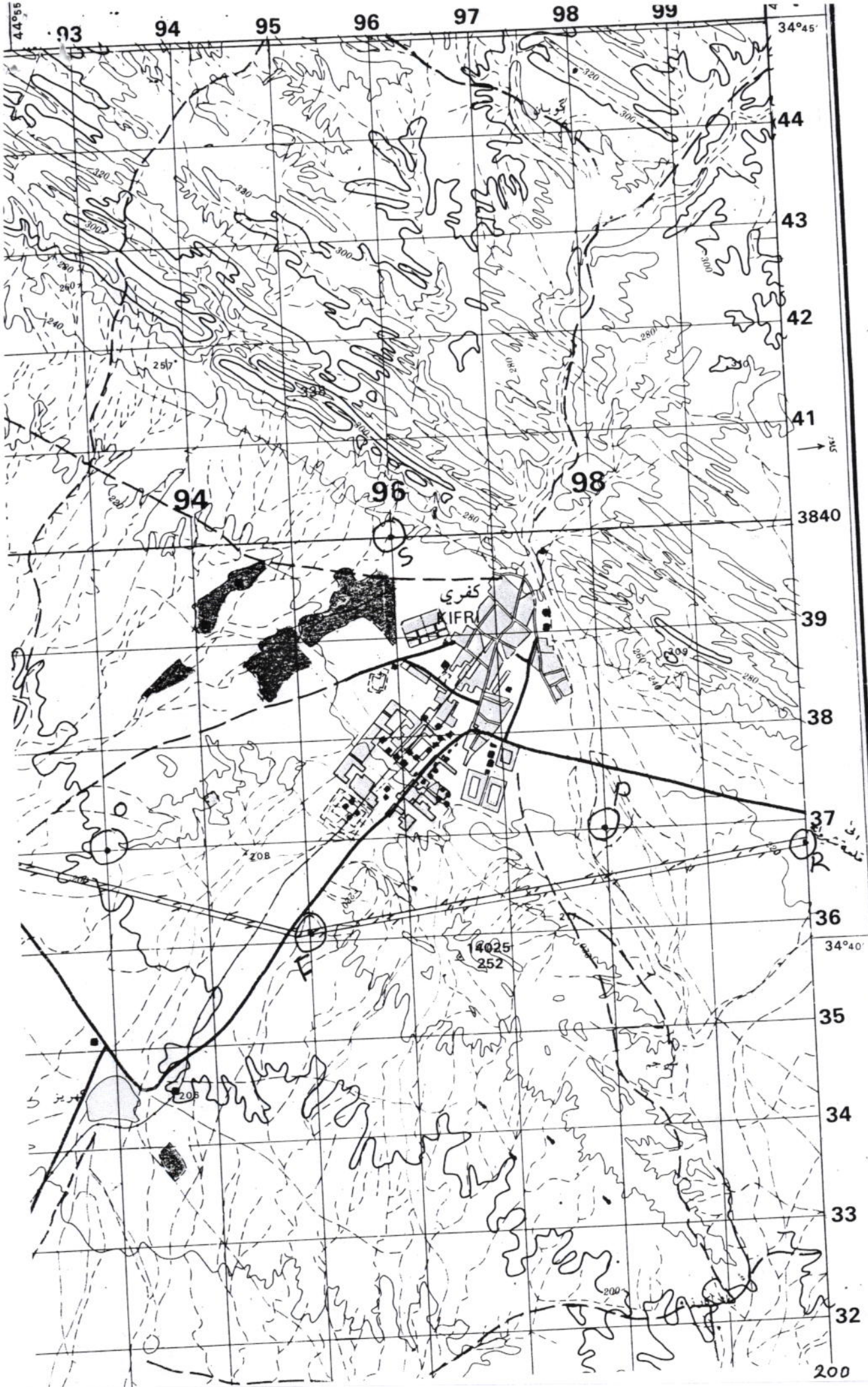
- a) Compute the geodetic distance between A and B if:

$$\varphi_A = 22^\circ 10' 15'' \quad \lambda_A = 38^\circ 20' 45''$$

$$\varphi_B = 28^\circ 15' 15'' \quad \lambda_B = 42^\circ 30' 30''$$

- b) List with short explanation steps of Digital map production.

(Good Luck)



(1) اوجبة عدد 2

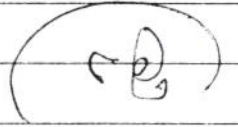
Q. a) $1/250000 \Rightarrow 1 \text{ cm} = 250 \text{ m} \Rightarrow 1 \text{ mm} = 25 \text{ m} \Rightarrow 0.1 \text{ mm} = 2.5 \text{ m} \Rightarrow 0.2 \text{ mm} = 5 \text{ m}$

$1/50000 \Rightarrow 0.2 \text{ mm} = 10 \text{ m}$

$1/100000 \Rightarrow 0.2 \text{ mm} = 20 \text{ m}$

$1/200000 \Rightarrow 0.2 \text{ mm} = 40 \text{ m}$

$1/250000 \Rightarrow 0.2 \text{ mm} = 50 \text{ m}$



Q. b) The geodetic dimensions are:

$1/250000 \Rightarrow$

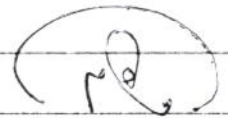
$1/100000 \Rightarrow 30' \times 30'$

$1/50000 \Rightarrow 15' \times 15'$

$1/25000 \Rightarrow 7'30'' \times 7'30''$

$1/50000 \Rightarrow$

$1/100000 \Rightarrow$



Q. c) The number of Maps that Contains in map scale $\frac{1}{1000000}$ from scales:

$1/500000$ is 4 maps

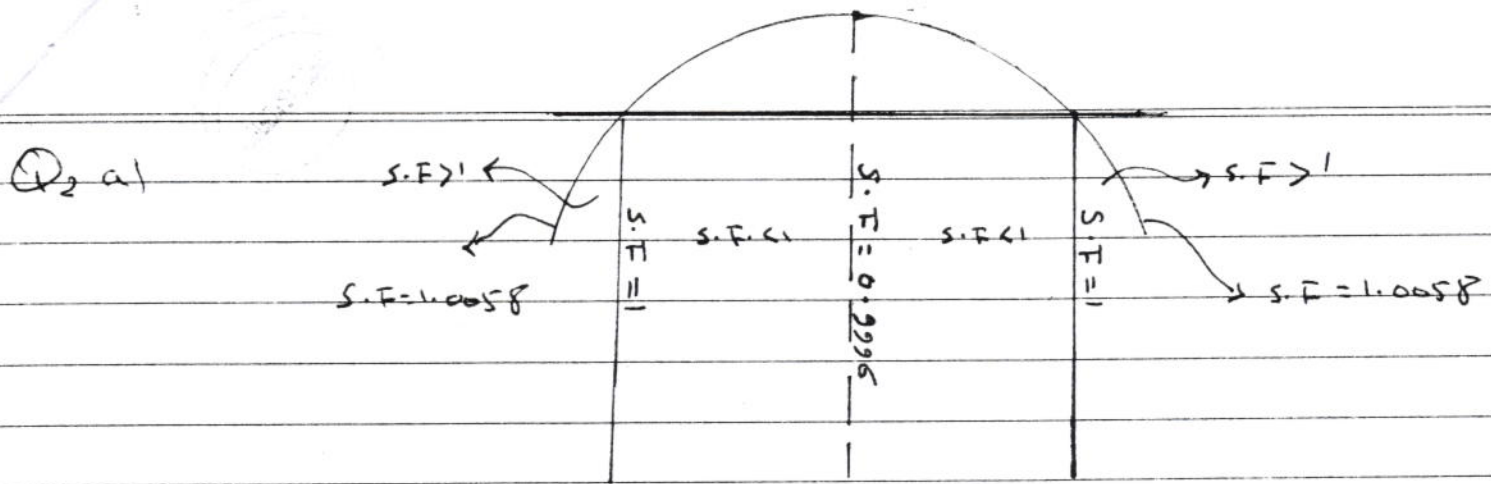
$1/250000$ is 16 maps

$1/100000$ is 96 maps

$1/50000$ is 384 maps

$1/25000$ is 1536 maps





in each zone these values of S.F. are same

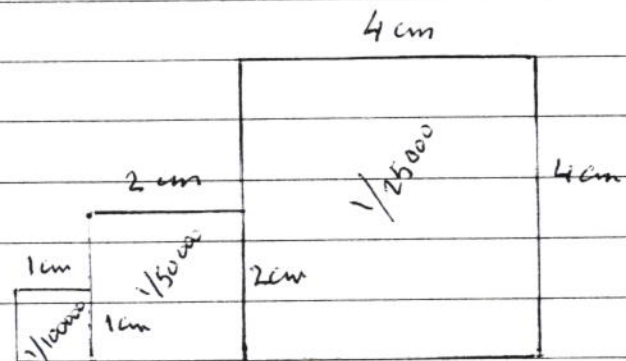
Q2 b) The main differences between N and P images are

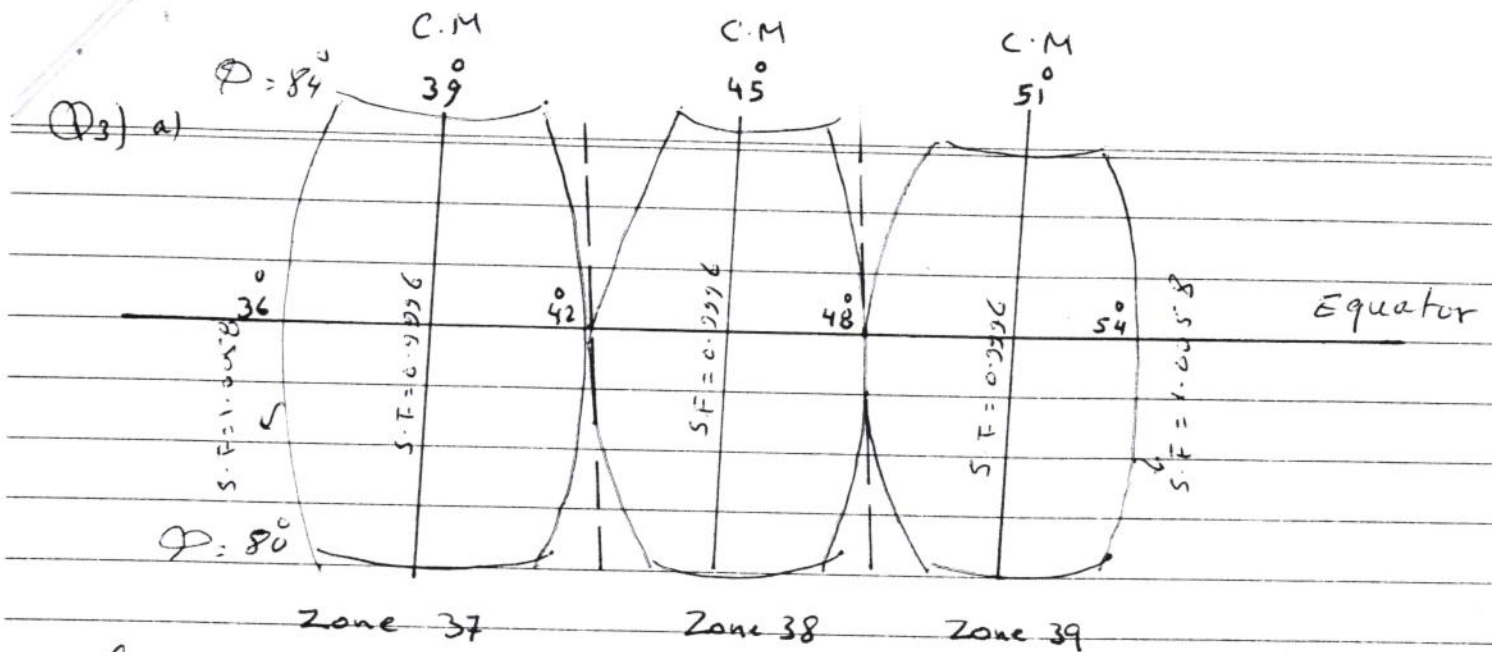
- 1) all features in positive image appears as black
- 2) all background in positive image appears as white

Q2 c) The main differences between Contact and Camera are?

- 1) in Contact Instrument there is no changing in scale while in Camera we can enlarge 5 times and reduce scale to 10 times
- 2) in Contact we produce P from negatives or N from positives while in Camera we can also produce positive from positive if we use direct positive films
- 3) in both we can use filters to produce colors

Q2 d)





for each Zone : $E = 500000 \text{ m}$ (false origin Easting)
 $N = 00$

Q3 b) in the map below :

(X, Y) for points : $O = (E, N) = (193000^{\text{m}}, 3837000^{\text{m}})$

$P = (E, N) = (198000^{\text{m}}, 3837000^{\text{m}})$

$S = (E, N) = (196000^{\text{m}}, 3840000^{\text{m}})$

$FR = 5 \text{ km}$

Contour interval = 20^{m}

Q3 c) * mirror reading : The reading as you look in a mirror will be reverse when we use the Contact or Camera to produce Image from positives or negatives

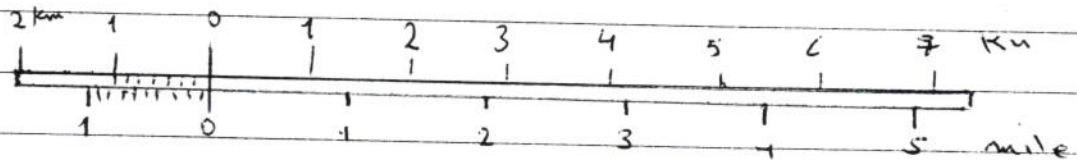
* halftone printing : This technique means we produce a separation from any color using screen and peel/Coat layers with a specific percentage.

* offset : it is the relation between setting ink and water in offsetting printing. so the area of ink will be not mixed with area covered by water.

map : an orthogonal projection of earth on a paper

with a certain scale, all features on map represented by a certain symbols.

* Double linear scale: is a kind of scales used 2 units of measuring such as km and mile, its length 10-15 cm, it has 2 kinds of divisions senior and minor divisions.



(R2)

Q4 a) The methods of representation relief on maps are?

- 1) Shading method
- 2) Angled maps
- 3) Stereo maps
- 4) Hachering method
- 5) Panoramas (sand tables)
- 6) Contour lines
- 7) Colors methods

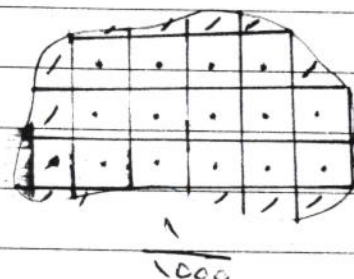
Shading method depends upon Contour lines method using the sun with an angle 45° so the shade will be distribute depending to the position of feature with respect to the sun position, they use air brush elaborate to push ink to the surface of Map, then we eliminate Contour lines to be not make a map heavy and the shade only will stay on map area.

(R2)

Q4 b) The method of squares to compute area of Irregular closed shape on a map is to divide that area to squares such as in the numerical example below:

$n = \square$ Complete squares of area

$m = \square$ non complete squares of area

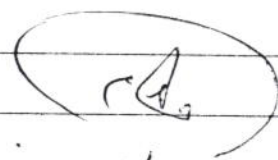


$$\text{area} = n + \frac{m}{2}$$

$$= 15 + \frac{12}{2} = 21 \text{ cm}^2$$

if the scale = $1/1000 \Rightarrow 1 \text{ cm} = 1000 \text{ m} \Rightarrow 1 \text{ cm}^2 = 1000^2 \text{ m}^2$

\therefore the area is $21 \times 100 = 2100 \text{ m}^2$

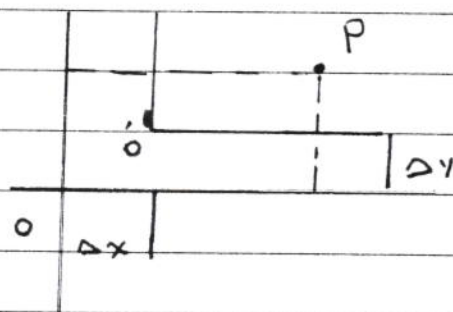


Q4 c) methods of transformation coordinates, in a plane when the origin is fixed between 2-coordinate systems are:

1) Shifting case

$$x' = x + \Delta x$$

$$y' = y + \Delta y$$



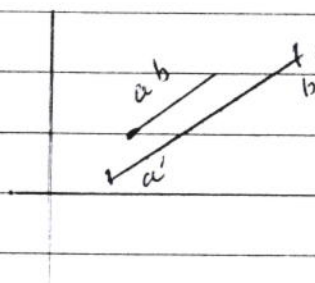
2) changing scale

we must find the ratio between new and old distances so

$$m = \frac{ab}{a'b'}$$

$$x' = m \cdot x$$

$$y' = m \cdot y$$



Q5 b)

The main steps of digital map production are:

- 1) map digitizing step: to convert ~~line~~ features (Dots and lines and polygons) to (X, Y) coordinates and store it in a suitable devices using manual digitizers or line followers or scanners.
- 2) make various operations in Computers such as changing scale or redesign future maps and any statistical or mathematical operations.
- 3) presentation data (on monitors or printing maps using suitable plotters [Drum or flat plotters or ink jet plotter].
- 4) archiving maps in ^{new} map index.

re

3) rotating axes

clockwise:

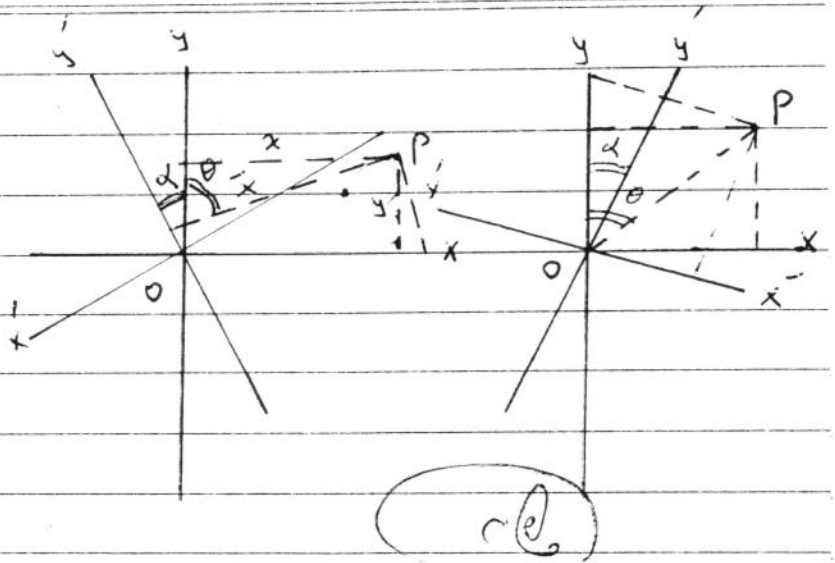
$$x' = x \cos \alpha - y \sin \alpha$$

$$y' = y \cos \alpha + x \sin \alpha$$

counterclockwise:

$$x' = x \cos \alpha + y \sin \alpha$$

$$y' = y \cos \alpha - x \sin \alpha$$



Q5 a) Using spherical triangle rules:

$$\Delta \lambda = 4^\circ 9' 45''$$

$$\begin{aligned} \cos \int_{AB} &= \cos(90 - \phi_A) \cos(90 - \phi_B) + \sin(90 - \phi_A) \sin(90 - \phi_B) \cos \Delta \lambda \\ &= \sin 22^\circ 10' 15'' \times \sin 28^\circ 15' 15'' + \cos 22^\circ 10' 15'' \times \cos 28^\circ 15' 15'' \\ &\quad \times \cos 4^\circ 9' 45'' \end{aligned}$$

$$= 0.992217083$$

$$\begin{aligned} \therefore \int_{AB} &= \cos^{-1}(0.992217083) = (7.153044021) \text{ radians} \times R \\ &= 795.3946896 \text{ km} \end{aligned}$$

where $R = 6371.1 \text{ km}$ 