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Date: __/__/20

NAME:

FARAN-ALI KHAN

ID:

7395

SUBJECT:

ADVANCED ENGG SURVEY

INSTRUCTOR:

ENGR ABDUL FARHAN:

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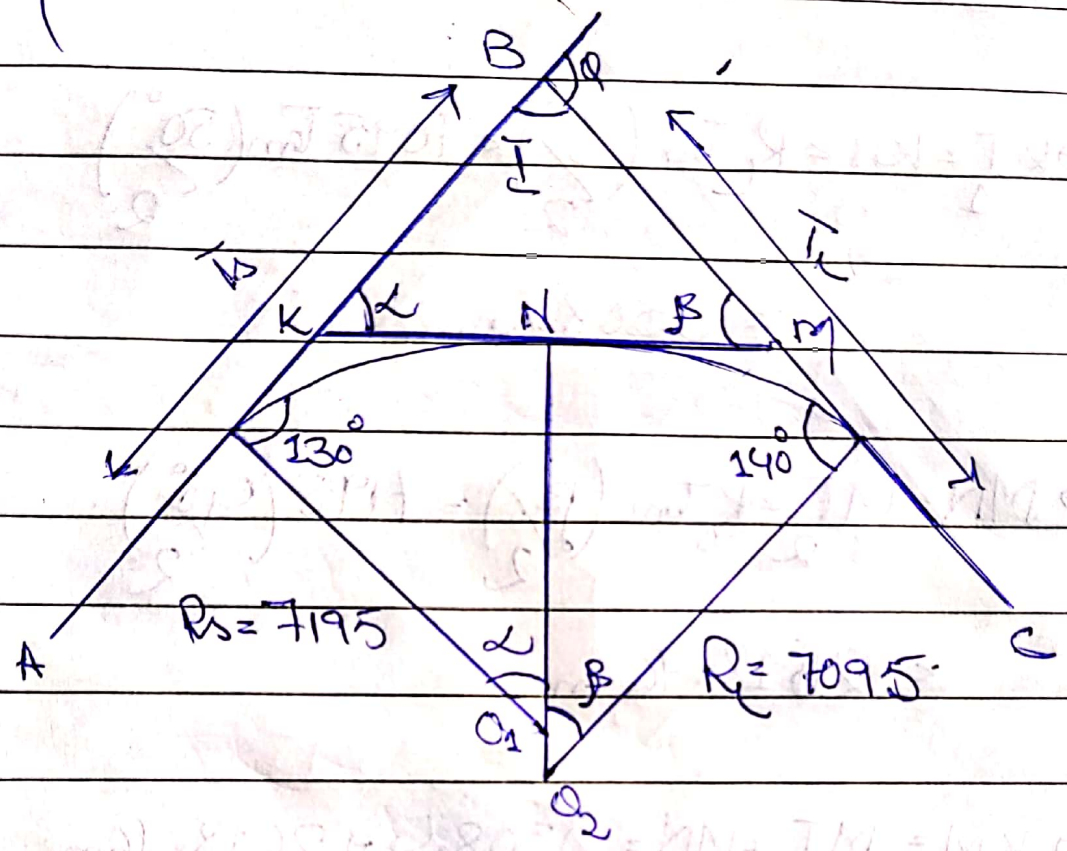
Question No (1):



Sol:

$AKM = 130^\circ = \alpha$

$KMC = 140^\circ = \beta$

$R_1 = 7095$

$R_2 = 7195$

Intersection Point = 6995 m.

$\alpha = 180^\circ - 130^\circ = 50^\circ$

$\beta = 180^\circ - 140^\circ = 40^\circ$

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$\theta = \alpha + \beta = 90^\circ$

$I = 180^\circ - 90^\circ = 90^\circ$

$\rightarrow KT_1 = KN = R_1 \tan\left(\frac{\alpha}{2}\right) = 7095 \tan\left(\frac{50^\circ}{2}\right)$

$= 3308.4\,m$

$\rightarrow MN = MT_2 = R_2 \tan\left(\frac{\beta}{2}\right) = 7195\left(\frac{40^\circ}{2}\right)$

$= 2618.76\,m$

$\rightarrow KM = MT_2 + MN = 3308.4 + 2618.76\,m$

$= 5927.16\,m$

$\rightarrow$ Find ΔBKM by sin rule:

$\frac{BK}{\sin\beta} = \frac{MK}{\sin(I)}$.

$\rightarrow BK = \frac{MK \sin\beta}{\sin(I)} = \frac{5927.16 \times \sin(40)}{\sin 90}$

$= 3809\,m$.

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→ $BM = MK \sin\alpha / \sin(I) = 5927.16 \times \sin(50) / \sin(90)$

$= 4540.4\,m$

→ $TL = KT_1 + BK = 3308.4 + 3809$

$= 7117.4\,m$

→ $T_2 = MT_2 + BM = 2618.76 + 4540.4$

$= 7159.16\,m$

→ $L_c = \pi R_c \alpha / 180^\circ = 3.14 \times 7095 \times 50 / 180^\circ$

$= 6188.4\,m$

→ $L_s = \pi R_s \beta / 180^\circ = 3.14 \times 7195 \times 40 / 180^\circ$

$= 5020.5\,m$

Chainage of Intersection Point = 6995m

Minus T_1 = 7117.4m

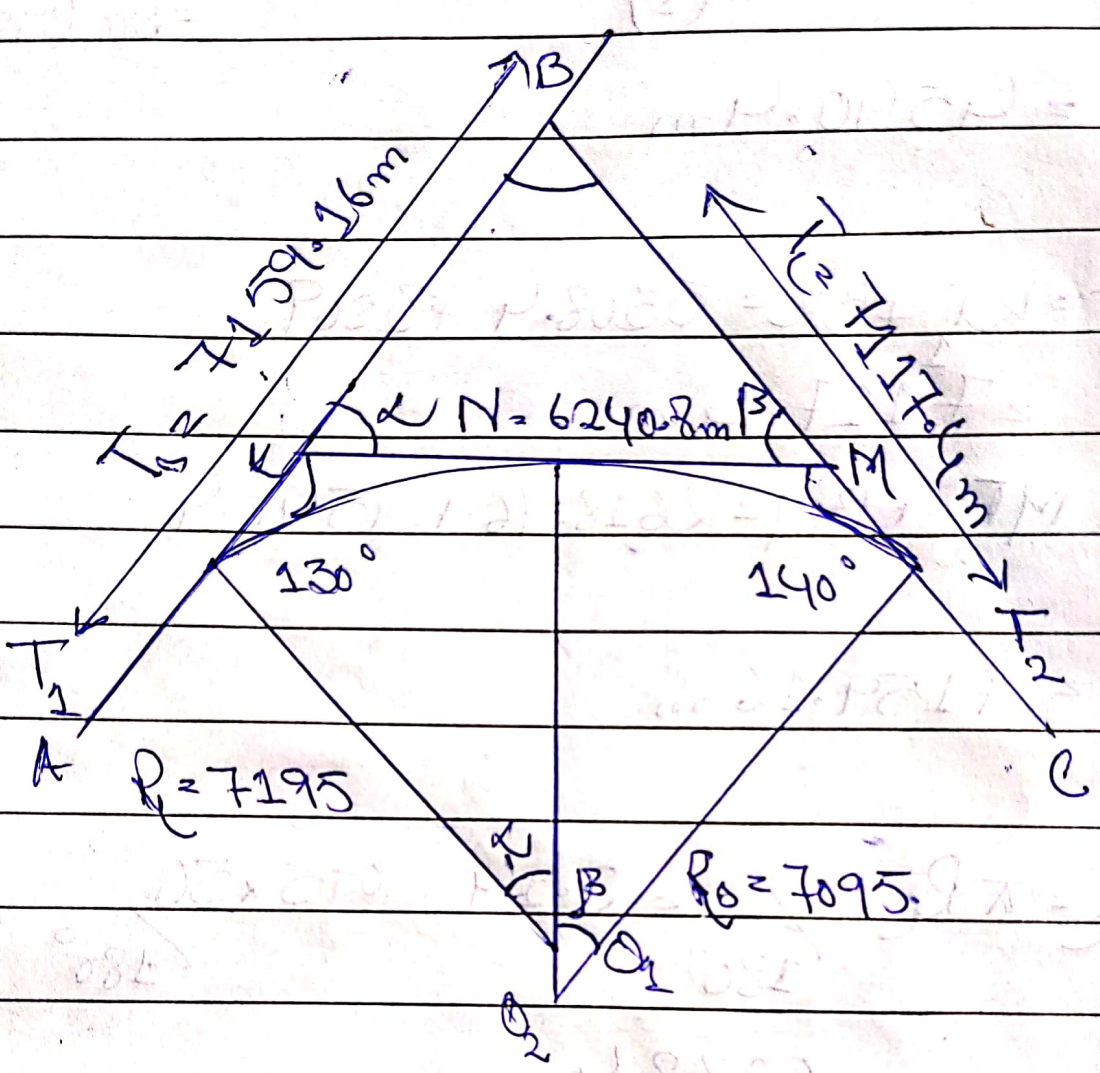
Chainage of T_1 = -122.4m

Plus L_c = 6118.4m

Chainage of Compound Curvature = N = 6240.8m

Plus L_s = 5020.5m

Chainage of T_2 = 11261.3m



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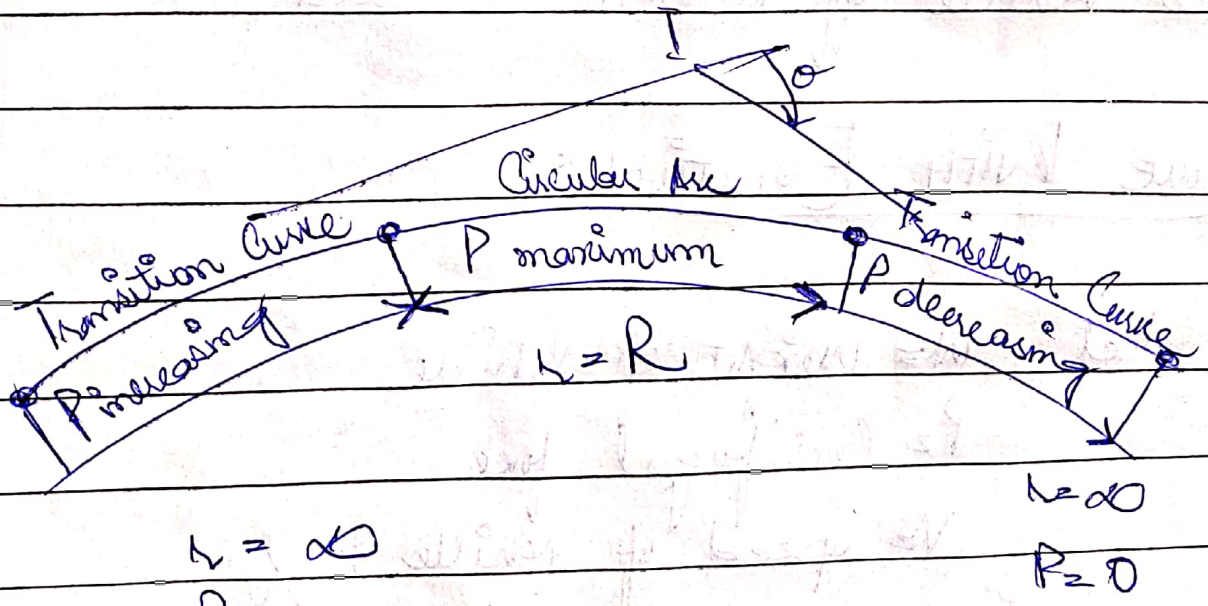
Question No (2):

Transition Curves:

A curve of varying radius is called a transition curve. It is also called spiral curve.

It is used on both highway and railway between Tangent and a circular curve in order to have a smooth transition from Tangent to the curve and from the curve to Tangent. It is also inserted between two branches of compound.



→ Centrifugal force is outward pull on a vehicle traversing a horizontal curve. When travelling at low speeds or on curves with large radii, the effects are minor. While travelling at higher speed around curves with smaller radii, the effects of centrifugal force increases.

When vehicle moves from tangent on to the curve the forces acting on it are weight of the vehicle.

→ Centrifugal force both acting through the centre of the gravity of the vehicle.

→ The effect of centrifugal force is to push the vehicle off the rail or road

PROVE WITH EQUATION :

Let W = weight of vehicle
P = Centrifugal force
V = Speed of vehicle, m/s
g = acceleration to gravity m/s^2
R = Radius of curve, m
h = superelevation, m

b = width of the road = m

For equilibrium the resultant R of the P & W must be equal and opposite to the reaction perpendicular to road or soil surface.

$$P = \frac{mv^2}{R} = \frac{Wv^2}{gR} \quad \because W = mg$$

$$\tan\theta = \frac{h}{b} = \frac{dc}{c} = \frac{P}{W}$$

$$\tan\theta = \frac{h}{b} = \frac{P}{W} = \frac{v^2}{gR}$$

$$h = b\tan\theta$$

$$h = \frac{bv^2}{gR} \longrightarrow \text{on highway}$$

$$h = \frac{bGv^2}{gR} \longrightarrow \text{on railway.}$$

Super elevation is gradually applied along a transition curve. Full super elevation is obtained at junction of the transition curve with circular curve.

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Question No (3):

	TRIANGULATION:	TRILATERATION:
1-	All angles are measured in Triangulation	All sides are measured in trilateration.
2-	Distance of baseline is measured.	Azimuth of of initial line is measured.
3-	Some check base lines are also measured to control scale error	Some check angles are measured to correct azmuth error.
4-	Intervisibility between stations is essential	For small areas it is possible to measure distance without intervisibility.
5-	There are more internal checks in comparison with trilateration in the same geometric fig.	There are less internal checks in comparison with Triangulation in the same geometric figure.
6-	The side lengths are computed on the basis of measured angles applying sine law.	The angles are computed on the basis of measured side lengths applying cosine law.

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PRINCIPLE OF TRIANGULATION:

1) If all three angles of and the length of one side of a triangle are known, then by trigonometry the lengths of the remaining sides of the triangle can be calculated.

2) If the co-ordinates of any vertex of the triangle and azimuth of any side are also known, then co-ordinates of the remaining vertices may be computed.

SINE-RULE:

$$\frac{a}{\sin(A)} = \frac{b}{\sin(B)} = \frac{c}{\sin C}$$

or

$$\frac{\sin(A)}{a} = \frac{\sin(B)}{b} = \frac{\sin(C)}{c}$$

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TRILATERATION & ITS PRINCIPLES

1) Trialeteration is a highly accurate and precise method of establishing and expanding horizontal control.

2) Method of control survey in which a network of triangles is used as in Triangulation system.

3) All the three sides of each triangle are measured in the field with the distance measuring instruments (EDM's, tapes).

4) Horizontal angles are not measured in half.

5) Angles in a trilateration system are computed indirectly from the lengths of the sides of triangle by cosine formula.

6) Few horizontal angles are also sometimes measured to provide check on compute angles.

7) Trilateration is adjusted after the computation of the angles and then co-ordinates of the stations are determined.

8) Vertical angles are also measured where elevation have not been established.

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Cosine Rule:

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$2bc \cos A = b^2 + c^2 - a^2$$

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$A = \cos^{-1}\left[\frac{b^2 + c^2 - a^2}{2bc}\right]$$

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Question No (4):

PART (B):

Sounding:

→ The process of determing depths below the water surface is called sounding.

→ Sounding is analogous to levelling on land

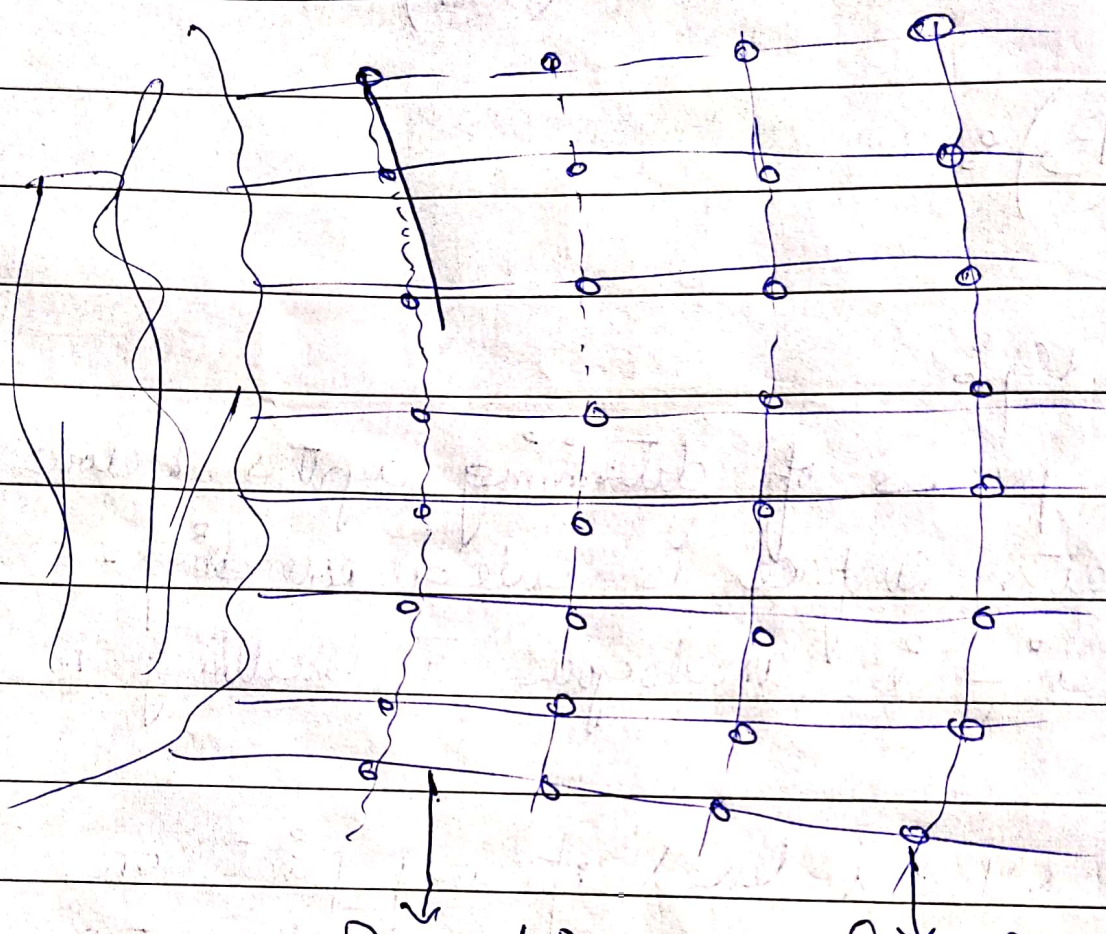
→ The reduced level of any point on the bottom of a water body is obtained by subtracting the sounding from the mean sea level.

PURPOSE FOR SOUNDING:

→ Preparation of accurate charts for navigation

→ Determination of the quantities of the material to be filled

→ Obtaining information for design breakwaters, sea walls etc.



Equipment for Sounding:

→ Shore signals and buoys.

→ Sounding equipment.

→ Angle measuring instruments.

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Question 4 (Part A):

1. Hydrographic Survey:

It is the branch of surveying which deals with water bodies e.g. lake, river etc.

The usual fundamental principles of surveying and leveling are adopted for acquiring data for determination of

→ Water Volume

→ Rate of flows

→ To determine the shape of the area underlying the water surface etc.

Purpose:

→ To determine the quantities of subaqueous excavations.

→ Measure areas subjected to scouring or silting in harbours or docks.

→ Locate rocks and other objects such as buoys, lights etc to aid safe navigation.

→ To prepare chart exhibition navigating the depths available.

5) Control floods, and the plan water supply and storage from rivers.

6) To develop water resources for power, irrigation and recreation

Factors of Hydrographic Surveys

→ The measurement of depth of water at various points is termed as sounding

→ Depth of sounding is referred to the water level at the time

→ Thereafter, the soundings are reduced to datum water level, to account for tidal water which undergo continual change of elevation with the help of gauges.

→ The field work consists of both horizontal as well as vertical control.

→ The horizontal control is established by Traversing or Triangulation

Question No (5)

PART (A):

Aerial Photogrammetry:

Aerial photogrammetry consists of using the imagery method in the air by UAVs to create computer-generated 2D and 3D Models. These models are topographical in nature, meaning they represent the dimensions and physical features of the area of land and in stunning accuracy. These models can be rotated and zoomed. They are then controlled by land survey and masure by photographic techniques. Since the 1st world war. The terrestrial photographic surveying has been replaced by aerial photographic due to the development of aeroplane.

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Why We Do It?

→ The survey work can be carried out with great speed

→ It can be used in great success for other purposes i-e classification of land or soil, geological or archeological investigation

→ Arid survey is highly technical and specialized work and must be carried out skilled trained and experience person

→ It is mainly made by government organization eg Survey of Pakistan Department.

PART (B) : (Q) : 5 :

1) PROCEDURE OF AERIAL PHOTOGRAPHY :

The Aerial photography procedure consists of the following.

1) Verify that the weather conditions are suitable for flying. Flying under conditions of low visibility should be avoided

2) Mount the camera according to the establishment procedure. Test the camera.

3) Fly the designed routes and take the photos according to plans.

4) Process the film according to specification to ensure radiometrically and geometrically quality images.

5) If necessary print out the missing photo information such as serial number etc.

6) Prepare contact prints from the negatives.

7) Inspect the photographs and verify it to have enough end laps, coverage of entire project.

8) Select photo that will be accurate.