



This exam measures the following ILOS: a-5, a-13, b-17, c-13, c-14, d-1

**Question (1)**

a) **Write short notes**

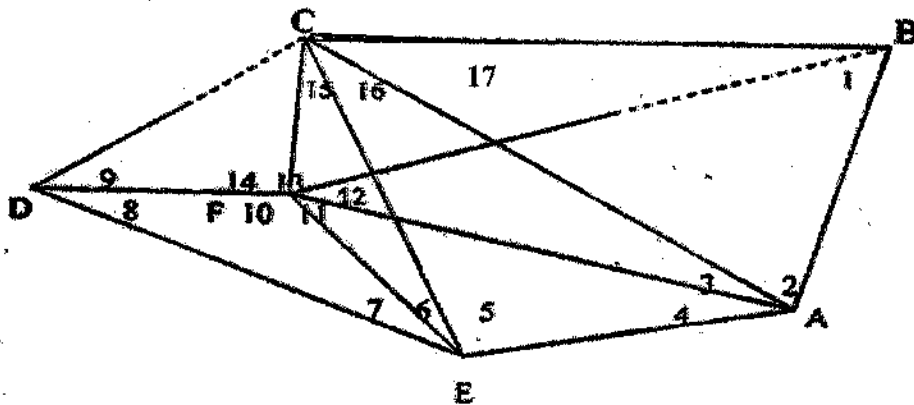
- 1. Geoid and Ellipsoid (3 Mark)
- 2. Three types of projections (3 Mark)
- 3. Types of networks (4 Mark)

b) Using this data  $\phi = N30^{\circ} 35' 51.3563''$ ,  $\lambda = E34^{\circ} 45' 47.2289''$  and  $h=886.328m$  and parameters of Clarke and helmart ellipsoids to calculate:

- 1- Cartesian coordinates in three dimensions. (5 Mark)
- 2- Transformation parameters between two ellipsoids. (5 Mark)

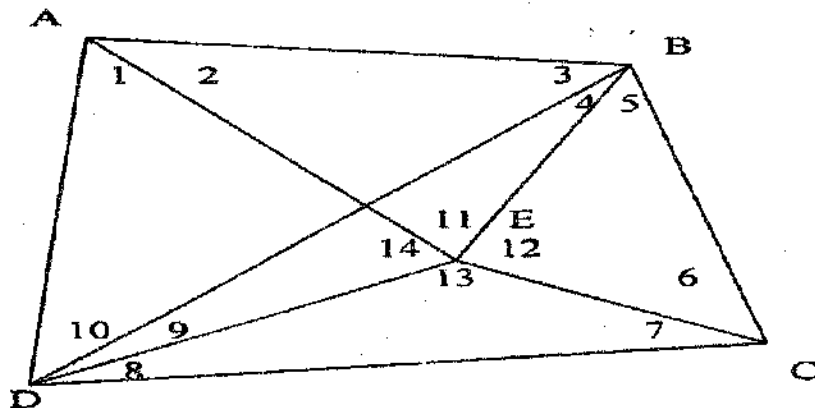
**Question (2)**

a) ABCDEF is a part of free triangulation network chose angle as the figure shown. Calculate the condition equations for its adjustment using two different methods? Write all condition equations? If station B is not occupied, find the number of conditions in this case? (10 Mark)



b) It is required to adjustment the following geodetic network using equal shift method? (15 Mark)

Angle	Observed value	Angle	Observed value
$O_1$	$54^{\circ} 16' 58''$	$O_2$	$35^{\circ} 18' 22''$
$O_3$	$40^{\circ} 57' 05''$	$O_4$	$18^{\circ} 12' 37''$
$O_5$	$51^{\circ} 42' 50''$	$O_6$	$54^{\circ} 37' 25''$
$O_7$	$24^{\circ} 48' 45''$	$O_8$	$17^{\circ} 19' 24''$
$O_9$	$13^{\circ} 19' 15''$	$O_{10}$	$49^{\circ} 27' 39''$
$O_{11}$	$85^{\circ} 32' 12''$	$O_{12}$	$73^{\circ} 39' 57''$
$O_{13}$	$137^{\circ} 52' 06''$	$O_{14}$	$62^{\circ} 56' 08''$



### Question (3)

Discuss these parts in detail:

- 1- Geodetic Surveying(2 Mark)
- 2- Global Positioning System (GPS)(5 Mark)
- 3- NACN and HARN(3 Mark)

### Question (4) (15 Mark)

1- An airplane traveling from point E ( $32^{\circ} 22' N, 42^{\circ} 34' W$ ) to point F ( $40^{\circ} 42' N, 42^{\circ} 34' W$ ) across point G ( $40^{\circ} 42' N, 21^{\circ} 30' E$ ):

- a) Determine the total traveling distance EFG?
- b) Determine the geodetic area of the spherical triangle EFG?

Determine the percentage error if the area EFG is computed as a plane triangle?

2- A, B & C are three triangulation stations, D & e represents two obstructions lies on the lines AB & BC respectively. The elevation of the triangulation stations are as the following: A= 240 m, B= 630 m & C= 810 m. the elevations of the two obstructions D & E are 332 m & 724 m respectively. Find the optimum height of tower at B to observe the other triangulation stations A & C from B (the line of sight must be clear from the ground by at least 6m), the tables give all required data ( $R = 6376 \text{ km}$  &  $k=0.07$ ):

3-

line	Bearing	line	Length (km)	line	Length (km)
AB	$92^{\circ} 18'$	AD	11.2	BE	29
AC	$162^{\circ} 48'$	BD	18.5	AC	42.3

**Good Luck**  
**D. Magda Farhan**