June 2019

ADVANCED SURVEYING

Time Allowed: 3 Hours *Full Marks: 70*

Answer to Question No.1 is compulsory and to be answered first.
This answer is to be made in separate loose script(s) provided for the purpose.
Maximum time allowed is 45 minutes, after which the loose answer scripts will be collected and fresh answer scripts for answering the remaining part of the question will be provided.
On early submission of answer scripts of Question No.1, a student will get the remaining script earlier.
Answer any five questions from Group-A & B, taking at least two from each group.

1. A. Answer the following questions (any ten): 1x10

i) A series of closed contour lines on the map with lower to higher values inside them represents a _____.

ii) In a closed traverse, the sum of the measured interior angles, for a traverse having N sides, should be equal to _____.

iii) GIS stands for _____.

iv) An anallatic lens is: (Concave / Convex)

v) Overturning of vehicles on a curve can be avoided by using – (a) Transition curve, (b) Vertical curve, (c) Compound curve, (d) Reverse curve.

vi) The chord of curve less than peg interval is known as _____ chord.

vii) The outer spindle attached to the lower plate in a transit theodolite is known as – (a) Vernier plate, (b) Scale plate, (c) Plane table, (d) None of the above.

viii) If the reduced bearing of a line AB is N 30° W and length is 100 m, then the latitude and departure respectively of the line AB will be (a) +50m, +86.6m (b) +86.6m, –50m (c) +50m, –86.6m (d) +70.7m, –50m.

ix) Error in tacheometric surveying is due to – (a) Manipulation, (b) Sighting, (c) Natural error, (d) Instrumental error.

x) Remote sensing process is based on – (a) Convection, (b) Conduction, (c) Reflection of light, (d) Radiation.

xi) The versed sine of a curve is given by – (a) R(1-SinØ/2), (b) R(1-CosØ/2), (c) R(1-CotØ/2), (d) R(1-TanØ/2).

xii) The characteristic of Gale's table is that the independent co-ordinates of all points are brought to the _____ quadrant.

xiii) The multiplying constant is obtained by – (a) f/i, (b) i/f, (c) i×f.

xiv) The subtense bar is used to measure – (a) Vertical distance, (b) Horizontal distance, (c) Elevation, (d) Depression.

xv) Environmental conditions for the Earth can be monitored by which of the following? – (a) Remote sensing, (b) GPS, (c) Non-spatial data, (d) Tabular data.

B. Answer the following questions (any five): 2x5

i) Define the term swing of telescope.
ii) State any two objects of tacheometry.
iii) Define consecutive co-ordinates.
iv) What is anallatic lens?
v) Define degree of curve.
vi) Define the term latitude and departure.
vii) State any four modern survey instruments.
viii) Write the use of Gale's table.

Group-A

2. a) What are the types of cross sections for computation of volume?
b) Define a mass diagram.
c) For constructing a reservoir, an excavation pit with dimensions at bottom as 16 m x 12 m and height as equal to 5 m is to be made. If the sides of the excavation have slope of 2 horizontal to 1 vertical, calculate the volume of earthwork. Assume that the ground surface is level before excavation. 2+2+6

3. a) Mention different sources of errors in theodolite surveying.
b) Explain temporary adjustment required for theodolite. 5+5

4. a) What are the sign conventions of latitudes and departures?
b) From the following data of a closed traverse PQRS; calculate the length and bearing of the line SP. 2+8

Line	Bearing	Length
PQ	N 83°36′E	85 M
QR	N 42°15′E	137 M
RS	N 63°48′W	67 M.

5. a) The coordinates of two points P and Q are as follows: 5+5

Points	Coordinates	
	N	E
P	982.5	825.2
Q	1198.6	576.4

Find the length and bearing of line PQ.
b) Find the quantity of water, from the contour map of a reservoir, the following contour areas were recorded by plani metered; the top water level is 200 m and lowest point in the reservoir is 180 m.

Contour (m)	200	195	190	185	180	175
Area in M^2	3850	3450	2600	800	450	200

Group-B

6. a) Draw a neat sketch of circular curve and show the following element:
i) Tangent length
ii) Deflection angle
iii) Apex distance
iv) Length of chord
b) Tabulate the data required for setting out a curve by the deflection angle method, considering the following instructions:
i) Angle of intersection = 145°
ii) Chainage of point of intersection = 1580 m
iii) Degree of curve = 5°
iv) Least count of the theodolite =20″
v) Peg interval = 30 m 2+8

7. a) Explain the method of repetition to measure horizontal angle using transit theodolite.
   b) State the difference between theodolite and tacheometer. 5+5

8. During the course of a tacheometric survey, in the following readings were taken:

Instrument station	Height of instrument in m	Staff station	Vertical angle	Staff reading	Remark
O	1.750	B.M.	–8°24′	1.250, 1.600, 1.950	R.L. of B.M. 312.670
O	1.650	C.P.	–7°12′	1.430, 1.580, 1.730	C.P. change point
P	1.570	C.P.	+9°36′	1.670, 1.950, 2.230	

The tacheometer was anallatic and the multiplying constant was 100.The staff was held vertical. Calculate the R.L. of station P. 10

9. a) What is super elevation? Define with a sketch why it is provided?
   b) A tacheometer was set on station A and following observations are taken on vertical staff.

Inst. Station	Observed	Distance Station	Stadia (m)	Readings
O	A	150	1.255	1.750
	B	200	1.000	1.900
	C	250	0.750	1.200

Find constant of this tacheometer. 2+3+5

10. a) Explain the working principal of EDM with neat sketch.
    b) State the key components of GIS. 5+5