

- N. B. :** (1) Question No. 1 is compulsory.  
 (2) Attempt any three question out of remaining questions.  
 (3) Illustrate answers with neat sketches wherever required.  
 (4) Attempt sub-question in order.  
 (5) Assume any suitable data if required and state the same clearly.  
 (6) Figures to right indicate full marks.

1. Write short notes on any five :- 20
- (a) Tacheometric contouring  
 (b) Remote sensing and its applications a2zSubjects.com  
 (c) Elements of simple circular curve  
 (d) Distance and gradient measurement with subtense bar  
 (e) Grade stake & boning rod  
 (f) Type of horizontal & vertical curves  
 (g) Beaman's stadia arc

2. (a) A tacheometer was set up at an intermediate point on traverse PQ & the following observations were made on vertically held staff 8

Staff station	Vertical angle	Staff intercept	Axial hair reading
P	+9°30'	2.250	2.105
Q	+6°0'	2.055	1.875

The instrument was fitted with an anallactic lense. Compute length PQ & RL of Q; if RL of P is 350.50 m.

- (b) Derive an expression for distance & elevation formula for inclined line of sight & staff held vertical. 7
- (c) Determine tacheometric constants from the following data 5

Distance (m)	Lower stadia Reading (m)	Upper stadia reading (m)
202	2	4
302	1.5	5

Also find distance when stadia wire readings are 1.5 m & 5.5 m.

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3. (a) Explain in detail how route surveying for canal is carried out 10  
 (b) Explain setting out of culvert 6  
 (c) State necessity of reverse curve & transition curve 4
4. (a) Explain setting out of curve by offsets from chords produced. 8  
 (b) Two straights AB & BC intersect at a chainage of 4242 m. The intersection angle being  $140^\circ$ . It is required to set out a  $5^\circ$  simple circular curve to connect the straights. Calculate the data necessary to set out the curve by method of offset from chord produced at an interval of 30 m. 8  
 (c) Write short note on Sight distance & stopping sight distance. 4
5. (a) A road 8 m wide is to deflect through an angle of  $60^\circ$  with radius of 300 m. The chainage of intersection point being 3605 m. A transition curve is to be used at each end of the circular curve of such a length to gain a radial acceleration of  $0.5 \text{ m/s}^3$  when the speed is 50 kmph. Find:-  
 (1) Length of transition curve 1  
 (2) Super elevation 1  
 (3) Chainage of all the junction points 6  
 (4) Offset at  $x=L/4$ ;  $L/2$ ,  $3L/4$  &  $L$  2  
 (b) A 3% rising gradient meets a 2% down gradient. A vertical curve of 200 m long is to be used. The peg interval being 20 m. Calculate the curve points by tangent correction method and calculate the required staff readings. RL of apex is 350 m & its chainage is 1000 m. 10
6. (a) Write short notes on :-  
 (i) GPS & its applications 4  
 (ii) Principle of EDM 4  
 (iii) Elements of compound curve 4  
 (b) List various modern instruments with their specific use. Describe in detail working of total station. 8