(Time: 3 Hours) **[Marks: 80]**

Please check whether you have got the right question paper.

1. Question number 1 is compulsory.
2. Solve any 3 questions out of remaining.
3. Assume data wherever necessary and clearly mention the assumptions made.

Attempt sub questions in order.

1 **Compare any five:** **20**

a Surveyors compass and Prismatic compass.

b Direct and indirect ranging

c. Open and closed traverse

d. Direct reading vernier and Retrograde vernier.

e. Consecutive and independent co ordinates

f. Fixed hair method and movable hair method in tacheometry.

2 **a** Discuss sources of errors in compass surveying. **05**

b Write short note direct method of chaining along sloping ground. **05**

c. Calculate the fore bearings and back bearings of a closed regular pentagonal traverse ABCDEA, if the bearing of first line AB is N 45^o45^oW **10**

3 **a** Explain repitiont method of vertical angle measurement with theodolite **05**

b Find the length and bearing of PQ and angles APQ and angle BQP, as it was not possible to observe the length and bearing of a line PQ directly. The following observations were taken from A to B **10**

Line	Length in m	Bearing
AP	252	S70^o45^oW
AB	628.8	N 29^o45^oE
BQ	231	N 81^o45^oW

c. Discuss various methods of balancing of theodolite traverse. **05**

5 **a.** Explain plane table surveying by radiation. State its suitability. **05**

b. Discuss characteristics of contours **05**

c. What is tacheometer? State principle of tacheometry. **05**

d. Explain the procedure of finding RL of top of tower with one plane method. **05**

6 **a.** Determine the gradient between stations A and B from the data shown. The multiplying and additive constants of tacheometer are 100 and 0.3 **10**

Staff Station	Staff intercept	Bearing	Vertical Angle	Axial hair Readings
A	2.37	345^o	$+15^o$	1.435
B	2.425	75^o	$+10^o$	1.835

b. Explain working of Amsler planimeter **05**

c. A railway embankment is 9m wide at formation level with side slopes 2:1. Assuming the ground to be level transversely, calculate the volume in a length of 180m. The central height at 30m interval is 0.6, 0.8, 1.5, 1.8, 0.75, 0.3 and 0.67m respectively. Use trapezoidal method. **05**

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