

- (b) A line AB was measured with a steel tape which was exactly 30 m at a temperature of 20° C and pull of 10 Kg. The measured length was 1650 m. The temperature during measurement was 30°C and the pull applied was 15 Kg. Find the true length of the line, if the cross sectioned area of the tape was 0.025 cm². The coefficient of expansion of the material of the tape per degree Celsius is 3.5×10^{-6} and modulus of elasticity of the material of tape is $E = 2.1 \times 10^6$ Kg/cm².
12. (a) In an anti-clockwise traverse ABCA, all the three sides were equal in length. The magnetic fore-bearing of the line BC obtained by prismatic compass was 15° 30'. The bearing of the sun observed was 184° 30' at local noon with the compass. Calculate the magnetic bearing and true bearing of all the sides of traverse.

Or

- (b) The magnetic bearing of the line was found to be N60°30'W in 1992, when the declination was 5°10' E. Find its present magnetic bearing, if declination is 3°W.
13. (a) A vane 3.0 m above the foot of a staff was sighted at a point 3000 m away from the instrument. The observed angle of elevation was 2° 30'. The reduced level of trunnion axis being 200 m. Find the reduced level of staff station.
- Or
- (b) The captain of a ship just sees the top of a light house 75 m in height. If the eye level of the captain was 7 m above the sea level, determine the distance of ship from the light house.
14. (a) A railway embankment is 12 m wide. The ground is level in a direction transverse to the centre line. Calculate the volume contained in a 100 m length by trapezoidal rule and prismoidal rule, if the slope is 1.5:1. The centre heights at 20 m interval are 3.7 m, 2.6 m, 4.0 m, 3.4 m, 2.8m, 3.0 m and 2.2 m.

Or

- (b) The following offsets were taken in a chain survey, the offset distances from a chain line to the boundary line. The interval adopted was 10 m. 0, 3.55, 2.50, 2.75, 4.25, 3.5, 0 m.
- Calculate the area bounded between the chain line and the boundary line and the end offsets by (i) middle ordinate rule and (ii) average ordinate rule.

15. (a) A levelling staff is held vertical at a distances of 100 m and 300 m from the axis of a tacheometer and the staff intercept for horizontal sites are 0.99m and 3.00 m respectively. Find the constants of the instruments. The instruments is setup at station A and the staff is held vertical at a point B with the telescope inclined at an angle of depression of 10° to the horizontal, the readings on the staff are 2.670, 1.835, 1.000 m. Calculate the RL of B and its horizontal distance from A. The HI is 1.42m and the RL of station A is 450.5 m.

Or

- (b) Find upto which vertical angle, in stadia work, a sloping distance may be assumed to be horizontal so that the error may not exceed 1 in 300? The instrument is fitted with an analytic lens and the staff is held vertical.

PART C — (1 × 15 = 15 marks)

16. (a) With neat sketches explain in detail about different levelling instruments and their adjustments.

Or

- (b) An instrument was setup at a point 200m away from a transmission tower. The angle of elevation to the top of the tower was 30° 42', whereas the angle of depression to the bottom was 2° 30'. Calculate the total height of the transmission tower.