Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(CE-NEW)/SEM-3/CE-302/2011-12

2011

SURVEYING

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) Sum of three angles of spherical triangle

a) is always less than 180°

b) is always more than 180°

c) is equal to 180°

d) is always less than 180°, depending on the location of the triangle on spheroid.

ii) The staff reading taken on a point of known elevation is termed as

a) F.S. reading b) B.S. reading

c) I.S. reading d) bench mark.

iii) A true bearing of a line is known as

a) azimuth b) magnetic bearing

c) arbitrary bearing d) reduced bearing.

iv) The surface of still water is considered to be

a) level b) horizontal

c) smooth d) none of these.

v) At the equator the dip of the needle is

a) 180° b) 0°

c) 90° d) 45°.

vi) The relative closing error should not exceed

a) $\frac{1}{600}$ b) $\frac{1}{400}$

c) $\frac{1}{100}$ d) $\frac{1}{1000}$.

vii) In plane table survey, the operation which must be carried out is

a) resection b) orientation

c) intersection d) radiation.

viii) Fine adjustment in a theodolite is done by the

a) focusing screw b) tangent screw

c) clamp screw d) none of these.

ix) The characteristics of Gale's table is that the independent coordinates of all the points are brought to the

a) fourth quadrant b) first quadrant

c) third quadrant d) second quadrant.

x) The plan of an area has shrunk such that a line originally 10 cm now measured 9·5 cm. If the original scale of the plan was 1 cm = 10 m, correct distance corresponding to measured distance of 190 m in 'm' is

a) 200 b) 190 × 0·55

c) 210 d) none of these.

xi) Imaginary line joining point of equal elevation is known as

a) horizontal line b) level line

c) contour line d) vertical line.

xii) A steel tape of 30 m is supported on 4 supports with equal spacing by a pull of 80 N. The area of c/s of tape is 8 mm^2 and the weight of steel is 77 kN/mm^2. The sag correction in 'm' is

a) – 0·007411 b) + 0·007411

c) + 0·07411 d) none of these.

xiii) The instrument for measuring the area of fields from map is

a) Clinometer b) Planimeter

c) Theodolite d) Alidade.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. A traverse is made in the form of a square, taking in clockwise order. If the bearing of *AB* is 115° 30′, find the bearing of other sides.

3. a) A 20 m chain was tested before the commencement of the day's work and found to be correct. After chaining 840 m the chain was found to be 0·08 m too long. At the end of day's work, after chaining a total distance of 1376 m the chain was found to be 0·12 m too long. What was the true distance chained ? $2\frac{1}{2}$

   b) The adjusted coordinates of the successive points of a closed traverse for a five sided traverse is given below :

x (m)	1008	1073	1136	1062	902
y (m)	1008	972	1082	1154	1028

   Find the area enclosed within the survey lines. $2\frac{1}{2}$

4. Explain Bowditch's rule. How can this rule be applied graphically to eliminate closing error in a traverse ? 2 + 3

5. Write short notes on any *two* of the following : $2\frac{1}{2} + 2\frac{1}{2}$

   a) Alidade

   b) Cross-staff

   c) Local attraction

   d) Bench mark.

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

6. a) The following consecutive readings were taken along MN with a 4 m levelling staff on a continuously sloping ground at intervals of 15 m , 0·345 on *M*, 1·450, 2·630, 3·875, 0·655, 1·745, 2·965, 3·945, 1·125, 2·475, 3·865 on *N*.

The elevation of *M* was 60·350. Enter the above readings in a level book form. Work out the R.Ls. by rise and fall method. Also find the gradient of line *AB*. 8

b) A 20 m steel tape was standardized on flat ground at a temperature of 20°C and under a pull of 15 kg. The tape was used in catenary at temperature of 30°C and under a pull of *P* kg. The cross-sectional area of the tape is 0·22 cm^2 and its total weight is 400 gm. The Young's modulus and coefficient of linear expansion of steel are $2{\cdot}1 \times 10^6$ kg/cm^2 and 11×10^{-6} per degree Centigrade respectively. Find the correct horizontal distance if *P* is equal to 10 kg. 7

7. a) What is 'closing error' in a traverse ? How will you adjust such error ? 5

b) What is true meridian and magnetic meridian ? 2

c) The following bearings were observed while traversing an area with a compass :

Line	***FB***	***BB***
PQ	S 37° 30′ E	N 37° 30′ W
QR	S 43° 15′ W	N 44° 15′ E
RS	N 73° 00′ W	S 72° 15′ E
ST	N 12° 45′ E	S 13° 15′ W
TP	N 60° 00′ E	S 59° 15′ W

Find the corrected bearing of the lines. 8

8. Write down characteristics of contours. Briefly discuss about the contouring methods. Name the methods of interpolation of contour.

9. Calculate the ordinates at 10 m distances for a circular curve having a long chord of 80 m and a versed sine of 4 m.

   Two tangents intersect at chainage 1190 m the deflection angle being 36°. Calculate all the data necessary for setting out a curve with a radius of 300 m by deflection angles, the peg interval being 30 m. 5 + 10

10. A national highway curve of 625 m radius is to be set out connecting two straights. The maxiumu speed of the moving vehicles on the curve is restricted to 90 km/hour. Transition curves are to be introduced at each end of the curve.

    Calculate the following :

    a) A suitable length of the transition curve

    b) The necessary shift of the circular cruve

    c) The chainage at the beginning and at the end of the curve

    d) Tangential offset of the first junction point

    e) Total deflection angle of the first junction point.

    Assume a peg interval of 20 m on circular curve and 10 m on the transition curve.

    Angle of intersection = 130°24′

    Rate of change of acceleration = 0·25 m/sec^3

    Chainage at the point of intersection = 1092·5 m. 5 × 3

11. a) A tacheometer was set up at station *C* and the following readings were obtained on a staff vertically held :

Instrument Station	Staff Station	Vertical Angle	Hair Readings (m)	Remarks
C	Bench Mark (BM)	– 5° 20′	1·500, 1·800, 2·450	RL OF BM = 750·50 m
C	D	8° 12′	0·750, 1·500, 2·250	

Calculate the horizontal distance between the BM and staff station *D*. Also calculate the reduced level of the staff station *D*. Given the multiplying and additive constants of the tacheometer are 100 and 0·15 respectively. Draw the necessary figure to illustrate your answer. 10

b) Discuss the various types of errors that may occur in a compass survey. 5