Ref. No. : Ex/CON/PC/B/TS/214/2023

B.E. CONSTRUCTION ENGINEERING SECOND YEAR FIRST SEMESTER - 2023

SUBJECT: SURVEYING

Time : Three Hours **Full Marks : 50**

Part I

Use Separate Answer scripts for each Group

	No. of Questions		Marks
		Answer Q. No. 1 and any two from the rest.	
CO2 & CO4	Q.1 a)	(a) Two-point and three-point problems are methods of (i) Traversing (ii)Resection only (iii) Resection and orientation (iv) Orientation only. (b) The angle of dip at the equator is Q.1 A) (i) 0^0 (ii) 90^0 (iii)45^0 (iv) none of the above (c) The graduations in a prismatic compass (i) are inverted (ii) have zero at south (iii) are from 0^0 to 360^0 (iv) all the above. (d) The quadrantal bearing of a line is determined by a (i) Prismatic compass (ii) Surveyor's compass (iii) Celestial observations (iv) None of the above. (e) Napier's rule is applicable for the following triangles only (i) Obtuse angled (ii) Right angled (iii) Acute angled (iv) None of the above.	1 x 5
	Q.1 b)	Write short notes on the following: (i) Bowditch's rule (ii) Compass traverse (iii) Isogonic and agonic lines (iv) Alidade (v) Geodetic survey	1 x 5

[Turn over

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Part I

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	No. of Questions		Marks
CO2	Q.2a.	Deduce the relationship for 'Convergence of meridians'. What is zero convergence?	8
	Q.2b.	What is the geodetic area enclosed by the spherical triangle ABC on the earth's surface when the coordinates of the stations are as follows: Coordinate of A = 30^0N 45^0E Coordinate of B = 50^0N 60^0E Coordinate of C = Pole What will be the area of ABC when sphericity of the triangle is ignored? Hence calculate the percentage of error. Assume radius of earth as 6378 km.	12
CO3	Q.3a.	Explain the principle of plane table surveying.	3
	Q.3b.	Mention the various methods of plane table traverse. Explain any one of them giving neat sketch.	7
	Q.3c.	Illustrate any one method of resection with neat sketch.	10
CO2	Q.4a	What is magnetic declination? Explain the different variations of it.	7
	Q.4.b	In a closed traverse PQRST, the bearing of the line PQ was measured as $150^0 30'$. The included angles were measured as under: Angle P = $130^0 10'$ Angle Q = $89^0 45'$ Angle R = $125^0 22'$ Angle S = $135^0 34'$ Angle T = $59^0 9'$ Calculate the bearings of all other lines.	13

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Different parts of the same question should be answered together.

NB: Where XX = Last two digit of your class **EXAMINATION Roll No.**
Assume any suitable data not given

PART-II

CO1

Answer all questions from this block

1. (i) Explain the difference between contouring and levelling?
(ii) Explain any five important characteristics of contours with neat sketches?

(iii) Some observations are missing from the page of a filed book shown below. Find the missing readings from the available data.

Staff station	Back sight	Intermediate sight	Foresight	Height of collimation	Reduced level	Remarks
A					100.91	
B		1.085				
C		2.125				BM RL 100
D	1.315				101.26	
E			1.325	102.235		
F					101.61	

OR

The following readings were taken with a level:1.005,1.315,1.865,0.965,1.405,1.555,0.865,1.345,1.110,0.965,and 1.715. The instrument was shifted after third, sixth, and eighth readings. Tabulate the readings and find reduced levels of all the points by the height of collimation method. The fifth reading was to a bench mark of elevation 302.540. (2+4+6.5)

2. (i) Explain rise and fall method of reduction of levels?
(ii) Explain the difference between the height of collimation method and the rise and fall method of reduction of levels.

(iii) The following readings are reciprocal leveling observations across a river between two points A and B. Find the true difference in elevation between the two points.

Instrument at	Staff at A	Staff at B
A	1.441	2.613
B	1.772	2.950

OR

(i) Explain at least one method each to continue and measure the distance between points on either side of the obstacle in the case of (a) a pond (b) a river © a building

(ii) Find the normal tension of a tape 30m long if calibrating pull was 100N. The weight of tape was 16N, its cross-section area was 6.0 mm^2, and E = 200GN/m^2.

(iii) In order to find the width of a river, two points A and B were taken on one bank so that AB is approximately parallel to the river. A well-defined point C on the other side was marked. With an adjustable cross staff, <BAC =42° and <ABC =56° were measured. Find the width of the River if AB = 2**XX**m. (2+4+6.5)

CO4

Answer all question from this block

3. (i) From the traverse data given below, check whether the traverse closes. If not, balance the traverse using Transit's rule.

Line	AB	BC	CD	DA
Length	310.5	340.8	405.2	279.2
Station	A	B	C	D
Bearing angle	S45°E	N50°30'E	N54°15'W	S33°18'W

(ii) Explain the procedure for evaluating missing quantities in closed traverse.

OR

(i) Derive the distance and elevation formulae for an inclined line of sight with an angle of elevation.

(ii) Find the stadia constants from the data given below.

Instrument at	Staff at	Cross hair readings	Distance
o	P	1.135,1.285,1.435	OP = 30m
o	Q	1.025,1.324,1.625	OP = 60m

(7.5+5)

CO5 Answer all question from this block

4. (i) A curve of radius 280m is to be set out by offsets from long chord. The deflection angle 60 degree. Tabulate offsets from tangent point at 20m intervals for half the curve.
(ii) Explain the requirements of a transition curve. Derive the intrinsic equation of a circular curve. Derive the expressions for the elements of a circular curve?
(iii) What is a geographic information system? (5+5.5+2)

OR

(i) From the given data calculate all necessary data for setting out purpose of a transition curve (**ONLY DEFLECTION ANGLE TABLE FOR TRANSITION CURVE**) with **NECESSARY CHECKS**? Minimum peg interval = 2.0 m for transition curve and 5.0 m for Circular curve. Velocity = 60km/hr, Radius = 3**XX**m α = rate of change of radial acceleration = 1.1**XX**m/sec3 Meterage at intersection point = 80**XX**m, I=Intersection angle = 33°34'**XX**".
(ii) Explain briefly the linear methods of setting out a circular curve?
(iii) What are the five components of a GIS? Explain the following errors in GPS receivers: a) Ionospheic errors b) Tropospheric errors c) SA errors. (5+4+3.5)

NB: Where XX = Last two digit of your **EXAMINATION Roll No.**

Course objectives:

CO1: **Recognize** the importance of survey in the field of Civil Engineering and **associate** the basics of linear/angular/elevation measurement methods like chain survey, compass survey and levelling, Contouring etc. (K1 & K2)

CO2: **Explain** the significance of geodetic survey and **demonstrate** abilities to solve problems in triangulation, trilateration and spherical trigonometry (K2 & K3)

CO3: **Associate** importance of plane table survey to **perform** topographical survey and **operate** Total Station (K2 & S2)

CO4: **Apply** the basics of theodolite and tacheometric surveying, setting out works, principles of Photogrammetry, Remote sensing etc. (K3)

CO5: **Distinguish and generate** Horizontal and vertical Curves **and Recognize** various modern survey techniques including Basics of Geographical Information System (GIS) & Geographical Positioning System (GPS) (A1, K4 & K5)