

**B.E. CONSTRUCTION ENGINEERING SECOND YEAR FIRST SEMESTER  
SUPPLEMENTARY EXAM 2023**

**SUBJECT: SURVEYING**

Time : Three Hours

Full Marks : 100

**Part I ( 50 Marks)**

Use Separate Answer scripts for each Group

	No. of Questions		Marks
		<b>Answer Q. No. 1 and any two from the rest.</b>	
<b>CO2 &amp; CO4</b>	Q.1	<p>(a) Consider the following statements: The general principles of surveying are: 1. To work from part to whole. 2. To locate a new station by measurements from at least two reference points already established and /or identifiable. Which of the above statements are correct? (i) 1 only (ii) 2 only (iii) Both 1 and 2 (iv) Neither 1 nor 2.</p> <p>(b) The angle of dip at the pole is (i) <math>0^{\circ}</math> (ii) <math>90^{\circ}</math> (iii) <math>45^{\circ}</math> (iv) none of the above</p> <p>(c) The type of surveying in which the curvature of the earth is taken into account is called (i) Geodetic surveying (ii) Plane surveying (iii) Preliminary surveying (iv) Topographical surveying.</p> <p>(d) If the observed fore bearing of a line xy is <math>16^{\circ}26'</math>, the back bearing of the line is (i) <math>103^{\circ}26'</math> (ii) <math>118^{\circ}36'</math> (iii) <math>196^{\circ}26'</math> (iv) <math>206^{\circ}26'</math>.</p> <p>(e) The magnetic bearing of a line is S <math>30^{\circ}</math> E. If the declination is <math>6^{\circ}</math> West, what is the true bearing? (i) S <math>36^{\circ}</math> E (ii) N <math>36^{\circ}</math> W (iii) S <math>24^{\circ}</math> E (iv) N <math>24^{\circ}</math> W. Write short notes on the following:</p>	1 x 5
	Q.1 b)	<p>(i) Napier's rule (ii) Zero convergence (iii) Variations in magnetic declination (iv) Orientation of plane table (v) Fore bearing and back bearing</p>	1 x 5

[ Turn over

Ref. No. : Ex/CON/PC/B/Ts/214/2023(S)

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	No. of Questions		Marks																	
CO2	Q.2a)	What is spherical excess? Deduce the expression for it.	8																	
	Q.2b)	A traverse is run from a station A, latitude $52^{\circ}10'16''$ N, longitude $8^{\circ}56'26''$ W to a station B, latitude $52^{\circ}32'48''$ N and longitude $9^{\circ}15'18''$ W. Calculate the direction and length of the line AB at A and also at B. Hence, determine the 'convergence of meridians'. Assume radius of the earth as 6371154m.	12																	
CO3	Q.3a)	State the various accessories required for plane table surveying giving neat sketches.	2																	
	Q.3b)	State and explain the method of setting up and orienting the plane table.	6																	
	Q.3c)	Illustrate with neat sketch the three point method of orientation.	12																	
CO2	Q.4a)	Define quadrantal bearing and whole circle bearing. Name the instruments to measure these. How to convert from one system to the other. Explain giving examples.	7																	
	Q.4b)	A compass traverse PQRSTP was run anticlockwise and following readings were obtained. Local attraction was suspected. Determine the correct bearings of the traverse line. <table border="1" data-bbox="440 1543 1331 1888"> <thead> <tr> <th>Line</th> <th>FB</th> <th>BB</th> </tr> </thead> <tbody> <tr> <td>PQ</td> <td><math>149^{\circ}50'</math></td> <td><math>330^{\circ}15'</math></td> </tr> <tr> <td>QR</td> <td><math>78^{\circ}53'</math></td> <td><math>255^{\circ}43'</math></td> </tr> <tr> <td>RS</td> <td><math>42^{\circ}45'</math></td> <td><math>222^{\circ}45'</math></td> </tr> <tr> <td>ST</td> <td><math>301^{\circ}53'</math></td> <td><math>124^{\circ}53'</math></td> </tr> <tr> <td>TP</td> <td><math>212^{\circ}17'</math></td> <td><math>32^{\circ}02'</math></td> </tr> </tbody> </table>	Line	FB	BB	PQ	$149^{\circ}50'$	$330^{\circ}15'$	QR	$78^{\circ}53'$	$255^{\circ}43'$	RS	$42^{\circ}45'$	$222^{\circ}45'$	ST	$301^{\circ}53'$	$124^{\circ}53'$	TP	$212^{\circ}17'$	$32^{\circ}02'$
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Subject: SURVEYING

Time: Three hours

Full Marks: 100

*Different parts of the same question should be answered together.***PART-II ( 50 Marks)**

CO1	<p>Answer all questions from this block</p> <p>1. (a) Explain the difference between contouring and levelling?  (b) Explain any five important characteristics of contours with neat sketches?  (c) The following ten readings were obtained during a levelling work with the instrument being shifted after the 5<sup>th</sup> and 8<sup>th</sup> readings:  <b>1.315, 0.965, -2.345, 1.105, 0.875, 1.155, 1.305, 1.675, 1.345 and 1.875.</b> Find the reduced levels of the remaining points if the RL of First turning point is 190.00m.</p> <p style="text-align: center;"><b>OR</b></p> <p>The consecutive readings take during a levelling operation are as follows: <b>0.685, 1.315, -1.825, -0.635, 1.205, 1.235, 2.631, 1.355, -2.015.</b> The instrument was shifted after the third and sixth readings. The third readings were taken to a benchmark of assumed elevation <b>195.00.</b> Find the reduced levels of other points. <span style="float: right;">(2+4+6.5)</span></p> <p>2. (a) Explain rise and fall method of reduction of levels?  (b) Explain the difference between the height of collimation method and the rise and fall method of reduction of levels.  (c) 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.</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Instrument at</th> <th>Staff at A</th> <th>Staff at B</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>1.441</td> <td>2.613</td> </tr> <tr> <td>B</td> <td>1.772</td> <td>2.950</td> </tr> </tbody> </table> <p style="text-align: center;"><b>OR</b></p> <p>(a) 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  (b) 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<sup>2</sup>, and <math>E = 200GN/m^2</math>.  (c) 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, <math>\angle BAC = 42^\circ</math> and <math>\angle ABC = 56^\circ</math> were measured. Find the width of the River if <math>AB = 290m</math>. <span style="float: right;">(2+4+6.5)</span></p>	Instrument at	Staff at A	Staff at B	A	1.441	2.613	B	1.772	2.950
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CO4 Answer all question from this block

3. (a) The survey records of a closed traverse are given in the following table. Fill up the missing entries.

Line	AB	BC	CD	DE	EA
Length(m)	725	1060	1250	945	577.2
Bearing	S49°45'E	N62°30'E	N37°36'W	-	-

(b) Also find out the area of the traverse (ABCDE) Assume any arbitrary Bearing of Line BC

**OR**

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

(b) 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. (a) Briefly explain 'vertical curves' and 'shift of a transition curve'?

**OR**State the relationship between the radius of a curve and the degree of the curve?  
What is the intrinsic equation of transition curves?(b) From the given data calculate **only the deflection angles of the Transition curve** for setting out purpose with **NECESSARY CHECKS**? Minimum peg interval = 2m Velocity = 61km/hr Radius = 255m  $\alpha$  = rate of change of radial acceleration = 1.11m/sec<sup>3</sup> Meter age at intersection point = 320m I=Intersection angle = 34°34'20".

(c) What are the five components of a GIS? Explain the following errors in GPS receivers: a) Ionospheric errors b) Tropospheric errors c) SA errors.

(2+7+3.5)

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)