Ref. No.: **Ex/CE/PC/B/T/215/2024**

B.E. CIVIL ENGINEERING SECOND YEAR FIRST SEMESTER EXAM 2024

SUBJECT: SURVEYING I

Time : Three Hours **Full Marks : 100**

Use Separate Answer scripts for each Part

Part - I (Marks : 50)

<table>
<tr><th>Sl. No.</th><th>Question</th><th>CO</th><th>Marks</th></tr>
<tr><td>1</td><td>The angles at the stations of a closed traverse ABCDEFA were observed as given below:
<table>
<tr><th>Internal Angle</th><th>Lengths (m)</th><th>Whole Circle Bearing</th></tr>
<tr><td>$\angle A = 130°18'45"$</td><td>AB = 17.098</td><td>AF = 136°25′12"</td></tr>
<tr><td>$\angle B = 110°18'23"$</td><td>BC = 102.925</td><td></td></tr>
<tr><td>$\angle C = 99°32'35"$</td><td>CD = 92.782</td><td></td></tr>
<tr><td>$\angle D = 116°18'02"$</td><td>DE = 33.866</td><td></td></tr>
<tr><td>$\angle E = 119°46'07"$</td><td>EF = 63.719</td><td></td></tr>
<tr><td>$\angle F = 143°46'20"$</td><td>FA = 79.087</td><td></td></tr>
</table>
(a) Adjust the angular error in the observations, if any.
(b) Calculate the bearings of the traverse lines in the following systems: i) Whole circle bearing in the sexagesimal system & ii) Quadrantal bearing in the sexagesimal system.
(c) Calculate latitudes, departures, and closing error for the above-mentioned traverse, and adjust using transit rule.</td><td>[CO6]</td><td>[3+(2+2)+(3+3+4)] = 17</td></tr>
<tr><td>2</td><td>An embankment of 10 m wide with a side slope of 2:1. Assuming the ground to be level in a direction transverse to the center line, calculate the volume in cubic meter, contained in a length of 300m. The central heights at every 50m intervals are 1, 1.5, 1,33, 1.67, 2.00, 1.20, 0.5m.</td><td>[CO4]</td><td>[5]</td></tr>
<tr><td>3</td><td>Write down the characteristics of contours.</td><td>[CO2]</td><td>[5]</td></tr>
<tr><td>4</td><td>State the fundamental lines of a theodolite. State the direct relationship between them.</td><td>[CO1]</td><td>[3]</td></tr>
<tr><td>5</td><td>A closed traverse was conducted round an obstacle and the following observations were made. Work out the missing quantities:
<table>
<tr><th>Side</th><th>Length (m)</th><th>Azimuth</th></tr>
<tr><td>AB</td><td>160</td><td>Missing</td></tr>
<tr><td>BC</td><td>250</td><td>102°36′</td></tr>
<tr><td>CD</td><td>125</td><td>Missing</td></tr>
<tr><td>DE</td><td>300</td><td>270°00′</td></tr>
</table></td><td>[CO3]</td><td>[9]</td></tr>
</table>

6	The horizontal angle subtended at a theodolite by a subtense bar with vanes 2.5 m apart is 10'30". (a) Calculate the horizontal distance between the instrument and the bar. (b) Also find the error of horizontal distance if the bar was 3° from being normal to the line joining the instrument and bar stations.	[CO2]	[5]
7	The vertical angles to vanes fixed at 1 m and 3 m above the foot of the staff held vertically at a station A were $+4°30'$ and $+7°58'$ respectively. Find the horizontal distance and the reduced level of A if the height of the instrument, determined from observation on to a bench mark is 438.556 metres above datum.	[CO2]	[6]

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Use a separate Answer-Script for each part

Part - II (Marks : 50)

Answer all the questions.

1 (a) A 30m long tape was standardized at 25°C and under a pull of 110N. A horizontal distance was measured with a pull of 120N applied to the tape at a temperature of 35°C. The tape was supported at the ends. Find the measured horizontal distance. Given, the cross-sectional area of the tape=6mm^2; total weight of the tape=10.5N; α for steel=12x10^{-6}/°C; E for steel= 2.1x10^5 N/mm^2. [10]

(b) Explain the two principles of Surveying with neat sketches. [CO1] [6]

2 (a) The bearings of a closed traverse are given. Check whether the bearings are correct. If not, correct the bearings by *Method of internal angles*. [10]

Line	AB	BC	CD	DA
FB	74° 15'	107° 15'	224° 45'	307° 45'
BB	256° 00'	286° 15'	44° 45'	127° 00'

(b) Explain *Local Attraction* in details. [4]

(c) Explain the two types of *Traverse* with a neat sketch. [CO2] [4]

3 (a) Readings taken in order during a levelling work are given below. Find the RL of all points by *Height of Instrument Method* assuming the RL of the Benchmark to be 100 m. [10]

Staff Station	A	B	C	D	E	F	G
BS	0.535		1.268			2.035	
IS		0.924		1.745	0.848		
FS			1.001			2.223	1.376

(b) With a neat sketch describe the *Method of Traversing* in plane table surveying. [CO3] [6]