B.Sc. Engg. (CEE)/ 1ˢᵗ Sem.

3 October, 2023(Morning)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

Mid Semester Examination   Winter Semester: 2022-2023
Course No. CEE 4103   Full Marks: 100
Course Title: Surveying   Time: 1.5 hours

There are 6 questions. Question no. 1, 2, 3 and 4 are compulsory. Answer any one from
Question No. 5 and 6. Programmable calculators are not allowed. Do not write on this
question paper. The figures in the write margin indicate full marks.

1. **Answer any four questions shown below from (a) to (e):**

   (a) Difference clearly between plane and geodetic surveying.   (CO1-PO1)
   (b) What type of project/area chain Surveying is suitable? State the   (5X4=20)
   purpose(s) of 'Check line' and 'Base line' in case of chain
   surveying.
   (c) Write down the name of the instruments used in plane table
   surveying and briefly describe their usage.
   (d) Define:(i) True Meridian and True Bearing (ii) Magnetic Meridian
   and magnetic Bearing.
   (e) Define: (i) Plumb line (ii) Bench Mark (iii) Elevation

2. (a) A 30-m chain was tested before starting the day's work and found to be 20   (CO4-PO2)
   cm too short. After measuring a length of 1200 m, the chain was tested   (10)
   again and was found to be 10 cm too long. At the end of the day's work the
   chain was tested again and was found to be 30 cm too long. Find the true
   length of the line if the total length measured was 2648 m.

   (b) Describe the methods of Radiation and Intersection of plane tabling with   (CO4-PO2)
   proper figure.   (10)

3. Due to some problems with equipment, the bearings of two sides were not   (CO4-PO2)
   taken for a closed traverse ABCDEA. From the available data, compute the   (20)
   bearings of the two sides.

Line	AB	BC	CD	DE	EA
Length(m)	230.5	250.2	210.8	240.3	265.4
Bearing	N36°45′E	S82°48′E	S10°5′E	Missing	Missing

4. The ground level (G.Ls) at 20m intervals on a stretch of ground are as given below: (CO2-PO2) (20)

Chainage(m)	0	20	40	60	80	100	120
G.Ls(m)	214.2	214.8	215.1	216.1	216.9	217.4	218.2

The depth of cutting at chainage zero is 1.54 m and the formation goes at longitudinal upward slope of 1 in 40. Find the depth of cutting at each section and the volume of earthwork(both trapezoidal formula and prismoidal formula) in this stretch if the formation width is 6 m and the side slope is 2:1. The ground is level in the transverse direction.

5. The staff readings taken during a survey in order are as follows: 2.365, (CO2-PO2) 1.655, 0.695, 1.280, 2.355, 2.065, 1.755, 1.655, and 0.855. Find the reduced (20) levels of all the stations. The instrument was shifted after the readings 0.695 and 2.065. The reading 0.695 was to a benchmark of elevation 201.655 m. Apply necessary checks and draw diagram of the stations based on their R.L.

Station	B.S(m)	I.S.(m)	F.S.(m)	Height of the Instrument Axis (m)	R.L.(m)	Remarks
P	2.365					
Q		1.655				
R	1.280		0.695		201.655	Bench Mark
S		2.355				
T	1.755		2.065			Turning point
U		1.655				
V			0.855			

6. The following readings were observed in sequence: 1.324, 2.605, 1.385, (CO2-PO2) 0.638, 1.655, 1.085, 2.125, and 1.555. The third reading was taken to an (20) arbitrary benchmark of elevation 0.000. Find the reduced levels of all other points. Apply necessary checks and draw diagram of the stations based on their R.L.

Station	B.S(m)	I.S.(m)	F.S.(m)	Rise (m)	Fall(m)	R.L.(m)	Remarks
1	1.324						
2		2.605					
3	0.638		1.385			0.000	Bench Mark
4		1.655					
5	2.125		1.085				Turning point
6			1.555				

Equations' Table

1. $L = L'\left(\dfrac{l'}{L}\right)$

2. $A = A'\left(\dfrac{l'}{L}\right)^2$

3. $V = V'\left(\dfrac{l'}{L}\right)^3$

4. $C_g = a(T_m - T_c)L$

5. $C_g = \dfrac{(P - P_0)L}{AB}$

6. $C_g = nC_{g1} = \dfrac{n l_c (m l_1)^2}{2 a d^2}$

7. $P_h = \dfrac{0.2646\, r_2 \sqrt{AB}}{\sqrt{P_h - P_0}}$

8. Back Bearing = Force Bearing ≅180°

9. B.B of AB = F.B of BA

10. include angle=(2N−4)× 90°

11. exclude angle=(2N+4)× 90°

12. $\Sigma L = l_1 \cos\theta_1 + l_2 \cos\theta_2 + l_3 \cos\theta_3 + \cdots = 0$

13. $\Sigma D = l_1 \sin\theta_1 + l_2 \sin\theta_2 + l_3 \sin\theta_3 + \cdots = 0$

14. $A = \sqrt{s(s-a)(s-b)(s-c)}$

15. $A = \sum M_i [z_i]$

16. $M_i = M_{i-1} + \dfrac{D_{i-1} + D_i}{2}$

17. $\Delta = \dfrac{O_1 + O_2 + O_3 + \cdots + O_n}{n+1} \times L = \dfrac{L}{n+1}\,\Sigma O$

18. $\Delta = \left(\dfrac{O_1 + O_n}{2} + O_2 + O_3 + \cdots + O_{n-1}\right) d$

19. $\Delta = \dfrac{d}{3}\left[(O_1 + O_n) + 4(O_1 + O_3 + \cdots + O_{n-1}) + 2(O_2 + \cdots + O_{n-2})\right]$

20. $V = d\left[\dfrac{(A_0 + A_n)}{2} + A_1 + A_2 + \cdots + A_{n-1}\right]$

21. $V = \dfrac{d}{3}\left[(A_1 + A_n) + 4(A_1 + A_3 + \cdots + A_{n-1}) + 2(A_2 + A_4 + \cdots + A_{n-2})\right]$

22. $A = h(nh + b)$

23. $C_p = V_1 - V_2$

24. $C_c = \dfrac{d^2}{2R}$ (Subs)

25. $C_c = \dfrac{s}{2} \cdot \dfrac{d^2}{2R}$ (add)

26. $C_c = \dfrac{6}{7} \cdot \dfrac{d^2}{2R}$

27. $H = \dfrac{w}{2}\left[(h_A - h_b) + (h_d - h_B)\right]$

28. $D = (b + s\cot\alpha_2)\,\dfrac{\tan\theta_2}{\tan\alpha_1 - \tan\alpha_2}$

29. $s_a = D \tan\alpha_1$

30. $D = (KS + C)\cos\theta + h\sin\theta$

31. $H = L\sin\theta = KS\sin\theta + C\sin\theta$

32. $D = L\cos\theta = KS(\cos\theta)^2 + C\cos\theta$

33. $H = L\sin\theta = KS\dfrac{\sin 2\theta}{2} + C\sin\theta$

34. $\dfrac{Map\ Distance}{Photo\ Distance} = \dfrac{Map\ Scale}{Photo\ Scale}$