MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITRY EXAMINATIONS
2021/2022 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER SUPPLIMENTARY/SPECIAL EXAMINATIONS

FOR THE DEGREE
OF
BACHELOR OF SCIENCE IN CIVIL AND STRUCTURAL ENGINEERING

COURSE CODE: CSE 343

COURSE TITLE: ENGINEERING SURVEYING III

DATE: 29/07/2022   **TIME: 8.00 – 10.00AM**

INSTRUCTIONS:
1. This paper contains **FOUR** questions
2. Answer any **THREE** questions
3. Marks for each question are indicated in the parenthesis.
4. Examination duration is **2 Hours**

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 5 Printed Pages. Please Turn Over.

QUESTION 1   (25 Marks)

(a) Explain the following terms for a simple circular curve:
   - Point of intersection
   - Deflection angle to any point
   - Through Chainage
   - Degree of Curvature   (5 Marks)

(b) The tangent length of a simple curve is given as 315.064m and the deflection angle for a 25m chord is 1° 56′ 40" Calculate:
   (i)   the radius
   (ii) the total deflection angle   (10 Marks)
   (iii) the length of curve
   (iv) the final deflection angle

(c) A circular curve 800m radius has been set out connecting two straights with a deflection angle of 42°. It is decided for construction reasons that the mid-point of the curve must be moved 4m away from the centre. i.e towards the intersection point. The alignment of the straights is to remain unaltered. Calculate
   (i)   The radius of the new curve   (4 marks)
   (ii) The distances from the intersection point to the new tangent points   (2 marks)
   (iii) The deflection angles required for setting out 30m chords of the new curve (2 marks)
   (iv) The length of the final sub-chord.   (2 Marks)

QUESTION 2   (25 Marks)

(a) What is a transition curve?   (2 Marks)

(b) It is required to join two straights having a total deflection angle of 18°36' by a circular curve of 450m radius having a cubic spiral transition curves at each end. The design velocity is 70km/h and the rate of change of radial acceleration along the transition curve is not to exceed $0.3ms^2$. Chainage of I is 2524.20m.
   (i)   Determine the length of required transition curve.   (2 marks)
   (ii) The tangent length of curve   (4 marks)
   (iii) The chainage at the beginning and at the end of the total composite curve. (5 marks)
   (iv) The setting out angles for the first three 10m chords on a through chainage basis.
                                                                     (4 marks)

c) A compound curve AB, BC is to be replaced by a single arc with transition curves 100m long at each end. The chord lengths AB and BC are respectively 661.54 and 725.76m and the radii 1200m and 1500m. Calculate the single arc radius: If A is used as the first tangent point
                                                                     (8 Marks)

QUESTION 3   (25 Marks)

(a) Describe the two main purposes of Vertical curves in highways   (5 Marks)

(b) A parabolic vertical curve having equal tangent lengths is to connect a -3.5% gradient to a +2.3% gradient on a highway designed for a speed of 100kph. The absolute minimum sag K-value of 26 is to be used to obtain the length of the curve. The reduced level and the through chainage of the intersection point of the two gradients are 123.47m and 717.46, respectively. Calculate:
(i) The through chainages of the tangent points   (7 marks)
(ii) reduced levels of the tangent points   (4 marks)
(iii)The reduced levels along the curve at exact 20m multiples of through chainage.
                                                                                                  (9 marks)

QUESTION 4   (25 Marks)

(a) Levellings were carried out with the following results:

	Rise or Fall	Weight
P to Q	+ 4.32m	1
Q to R	+ 3.17m	1
R to S	+ 2.59m	1
S to P	- 10.04m	1
Q to S	+ 5.68m	2

The reduced level of P is known to be 134.31m above datum.
(i)   Draw a sketch of the leveling network showing the direction of the leveling. (2 marks)
(ii)   Form Observation equations in the form $L_i + V_i = h_k - h_j$.   (4 marks)
(iii)   Generate the normal equations in matrix format   (4 marks)
(iv)   Solve the equations to obtain heights of Q, R, and S.   (3 marks)

(b) With the aid of sketches discuss the principles of Single, Double and Tripple differencing as relates to Precise Relative GPS surveying.
                                                                                                  (9 Marks)

(c) Explain what you understand by selective availability   (3 Marks)