(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITRY EXAMINATIONS 2019/2020 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER EXAMINATIONS

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

COURSE CODE: CSE 343

COURSE TITLE: ENGINEERING SURVEYING III

DATE: WEDNESDAY 22ND JANUARY 2020 TIME: 3.00 – 5.00 PM

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 3 Printed Pages. Please Turn Over.

QUESTION 1 **(25 Marks)**

a) Differentiate between the following terms as used in curve designation
- Back Tangent and Forward Tangent
- Through Chainage and Degree of Curvature
- Compound Curve and Reverse Curve

(7Marks)

b) A circular curve of 950m radius has been set out connecting two straights with a deflection angle of 45°. For construction reasons it's decided that the mid-point of the curve should be moved 6m away from the centre. i.e towards the intersection point while keeping the alignment of the straights unaltered. Calculate
(i) the radius of the new curve (4 Marks)
(ii) the distance from the intersection point to the new tangent points (2 Marks)
(iii) the deflection angles required for setting out 28m chords of the new curve (2 Marks)
(iv) the length of the final sub-chord. (1 Marks)

c) A circular curve of radius 1100m is to be set out between two successive straights TI and IU on a proposed road. When the straights are set out on site, it is found that the intersection point is inaccessible. The distance from F, a point on TI, to G, a point on UI, is 197.36m. The horizontal angle at F measured clockwise from FG to FT is 165° 12' 34" and the horizontal angle at G measured clockwise from GU to GF is 173° 22' 48". The through chainage of F is 895.23m. Calculate the through chainages of the entry tangent point T and the exit tangent point U. (8 Marks)

QUESTION 2 **(25 Marks)**

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

(b) Two types of curves (i.e. clothoid and cubic parabola) are often used to represent transition curves. Explain the differences between the two curves
(4 Marks)

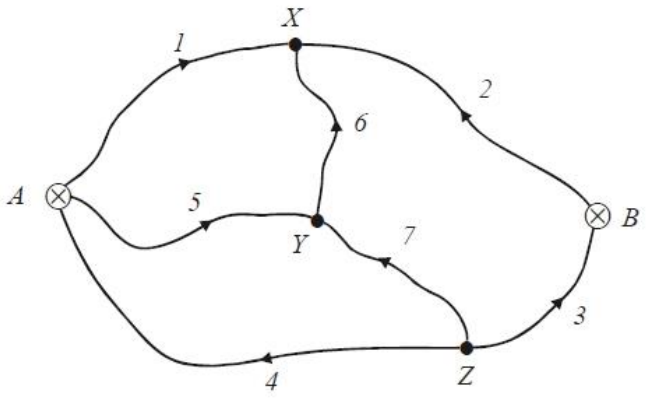
(c) The deflection angle between two intersecting straights is measured as 14° 28' 26". The straights are to be joined by a composite horizontal curve consisting of a central circular arc and two cubic parabola transition curves of equal length. The design speed of the road is 85kph and the radius of the circular curve is 600m. The rate of change of radial acceleration is to be 0.3m/sec^3. If the through chainage of the intersection point is 461.34m, calculate:
(i) The length of the transition curve (2 Marks)
(ii) The necessary shift of the circular curve (2 Marks)
(iii) The chainage at the beginning and at the end of the combined curve (6 Marks)
(iv) The value of the first two deflection angles of the transition curve assuming a peg interval of 20m. (9 Marks)

QUESTION 3 (25 Marks)

a) 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)

b) The diagram below shows a level network of height differences observed between the fixed stations *A* (RL 102.440 m) and *B* (RL 104.565 m) and "floating" stations *X*, *Y* and *Z* whose Reduced Levels (RL's) are unknown. The arrows on the diagram indicate the direction of rise. The Table of Height differences shows the height difference for each line of the network and the distance (in kilometers) of each level run.

Line	Height Diff	Dist (km)
1	6.345	1.7
2	4.235	2.5
3	3.060	1.0
4	0.920	3.8
5	3.895	1.7
6	2.410	1.2
7	4.820	1.5



Determine the best estimates of the RL's of *X*, *Y* and *Z* bearing in mind that the precision of the observed height differences is inversely proportional to the distance of the level run.
(14 Marks)

QUESTION 4 (25 Marks)

a) In GPS positioning what do the following terms mean?
- Pseudorange
- Point Positioning (4 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 (2 Marks)

d) For most GPS surveys, it is recommended that no satellites with an elevation of less than 10-15^0 above the horizon be used. Explain why?
(3 marks)

e) How are real-time GPS surveys carried out? What advantages do real-time surveys have over post-processed surveys? (7 Marks)