MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

SECOND YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR IN CIVIL ENGINEERING

ECV 201 SURVEYING I

DATE:1/8/2019   **TIME: 2.00-4.00 PM**

INSTRUCTIONS: Attempt questions **ONE** and any other **TWO** questions

QUESTION ONE (30 MARKS)

a)   Define the following terms as used in surveying   (10 Marks)
  i.   Preliminary survey
  ii.   Chaining
  iii.   Ranging
  iv.   Benchmark
  v.   Calibration

b)   Describe the principle of differential leveling   (5 Marks)

c)   The frequencies used by an EDM are 15 MHz and 150 kHz. Taking the velocity of light as 299,793 km/s and a measure distance of 346.73 m, show the computational processes necessary to obtain this distance, clearly illustrating the phase difference technique.

(8 Marks)

  d) Describe the Peg Test in leveling   (7 marks)

QUESTION TWO (20 MARKS)

a) Describe the phase difference method used in Electromagnetic distance measurement instruments   (4 Marks)

b) The height of an EDM set up at M is 1.495 m. The height of a reflector set up at P is 1.30 m. The height of the theodolite at M used to measure the vertical angle is 1.615 m. The height of the target at P on which the vertical sight is taken is 1.385 m. the slope distance after meteorological corrections is 1650.452 m. The measured vertical angle is +3°02'32''. What is the horizontal distance between M and P.

    (3 Marks)

c) A slope distance of 165.360 m (corrected for meteorological conditions) was measured from A to B, whose elevations were 447.401 and 445.389 m above datum, respectively. Find the horizontal length of line AB if the heights of the EDM instrument and reflector were 1.417 and 1.615 m above their respective stations.   (3 Marks)

d) Describe the ranging methods employed in surveying   (10 Marks)

QUESTION THREE (20 MARKS)

a) Discuss the corrections applied to an electromagnetic distance measurement instrument

    (5 Marks)

b) A red laser light (λ = 632.8 nanometers) operates at a temperature of 301.15 Kelvin, barometric pressure of 710 torr, and a vapour pressure of 30 torr. Given the Barrell and sears (1939) formula for the group index of refraction (n_g) and the ambient refractive index n_a. Considering the speed of light in a vacuum to be 299792.5km/s and a heat expansion coefficient of air 0.00367

    (7 Marks)

$$(n_g - 1)10^7 = 2876.04 + \frac{3(16.288)}{\lambda^2} + \frac{5(0.136)}{\lambda^4}$$

$$N_a = \left[\frac{n_g - 1}{1 + \alpha t}\frac{P}{760} - \frac{5.5(10)^{-8}}{1 + \alpha t}e\right]10^6$$

   i.   What is the refractive index

   ii.   What is the velocity though air?

iii.   What is the modulated wavelength if the modulating frequency is 44MHz?

c)   Outline the procedure of measuring distance along the ground by use of a tape   (8 marks)

QUESTION FOUR (20 MARKS)

a)   Describe the various instruments used for the determination of the length of line (7 Marks)

b)   Reduce the given booking data below using

    i.   The Rise & Fall and

    ii.   Height of collimation methods. The reduced level at the TBM is +43.00 Use arithmetic checks to support your results   (13 Marks)

Point	BS	IS	FS
TBM	0.771		
A	0.802		1.552
B		2.311	
C	3.580		1.990
D		1.220	
E		3.675	
F	2.408		4.02
G		0.339	
H			0.157

QUESTION FIVE (20 MARKS)

a)   Describe the pulse method used in Electromagnetic distance measurement instruments

    (5 Marks)

b)   Explain the different types of tapes used for distance measurement   (6 Marks)

c)   Although modern EDM equipment is exceptionally well constructed, the effects of age and general wear and tear may result to some errors.   Describe these errors and their calibration procedures   (9 Marks)