



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF INDUSTRIAL TECHNOLOGY

DEPARTMENT OF CIVIL AND WATER ENGINEERING

ENGINEERING SURVEY 1

TCW 2102

Supplementary Examination Paper

JULY 2016

This examination paper consists of 7 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements:None

Examiner's Name: P. KAMWEMBA

INSTRUCTIONS

1. Answer any four (4) questions
2. Each question carries 25 marks
3. Use of calculators is permissible

MARK ALLOCATION

QUESTION	MARKS
1.	25
2.	25
3.	25
4.	25
5.	25
TOTAL	100

QUESTION 1

(a) Name two classes of survey and explain the major difference between them . (3 marks)

(b) List two branches of survey and explain the purpose they serve . (4 marks)

(c) A triangular piece of land was measured with a 30 m tape and the sides were found to be 68 m , 51 m and 43 m . On checking the tape used it was found that the first 2 m was missing . Calculat the true area of this triangle . (5 marks)

(d) A steel tape of nominal length 30 m was used to measure a line AB by suspending it between supports and the following measurements were recorded :

Line	Length measured (m)	Slope angle	Mean temperature	Tension applied
AB	29,872	30 40'	50c	120N

The standardized length of the tape is known to be 30,014 m at 20oc and 50 N tension.

If the tape has a mass of 0,17 kg m-1 and a cross sectional area of 2mm² , Young's modulus (E) for the tape material is 200kN/mm² and the coefficient of expansion or contraction $\alpha = 0,0000112/0c$.

Calculate the horizontal length AB . (13 marks)

QUESTION 2

(a) List three types of planimeters that you learnt . (3 marks)

(b) Calculate the setting in square centimeters of a planimeter which obtained a reading of 2,672 revolutions when traced around a figure of known area of 4672m² , on a plan drawn to a scale of 1 : 500 . (5 marks)

(c) A planimeter is set to read 10 cm² and the zero circle constant supplied by the manufacturer of this planimeter is 16,559 . For testing the accuracy of this instrument , two circles having a common center were drawn on the plan , one larger and one smaller than the zero circle. With the pole block of the planimeter on the common centre , the tracing point was guided around the circumference of each circle with the following results :

Larger circle :

Initial reading = 3,987

Second reading = 12,875

QUESTION 2 continued

Smaller circle

Initial reading = 12,581

Second reading = 7,332

Calculate the radius of each circle and the zero circle

(13 marks)

(d) List four precautions that you would take when using a planimeter.

(4 marks)

QUESTION 3

Fig. 3 shows a farm . Given the following information :

Line	Length (m)
AB	422
BC	640
CD	456
AC	798

Offsets were set off from line AD to the irregular boundary in the direction A to D:

Chainage (m) A	Offset length (m)
0	0
150	12
330	4
434	19
798	0

Calculate the total area of the farm using any two methods for the irregular bounded area .

(25 marks)

QUESTION 4

(a) The ground slopes at 1 in 20 at right angles to the centre line of a proposed embankment which is 12,000m wide at formation height 3,050 m above the ground .

If the slope of the sides is 1 in 2. Calculate the area of this cross – section.(**10 marks**)

(b) A road is to be constructed on the side of a hill having a transverse slope of

1 vertical to 8 horizontal at right angles to the centre line of the road; the side slopes are to be similarly 1 in 2 in cut and 1 in 3 in fill; the formation width is to be 15,000m wide level. Calculate the distance of the centre line of the road from the point of crossover to give equality of cut and fill . **(15 marks)**

QUESTION 5

(a) A stockpile of 11tons of rock is to be established on a level surface by end tipping from a conveyor belt situated 20 metres vertically above this level surface . The stockpile will form a regular cone with an angle of repose of 37° . Calculate the height of the conical stockpile accepting that one cubic metre of broken rock equals 1,67 tons . **(10 marks)**

(b) Fig. 5 b shows contours on a dam construction site . The contours were drawn to a scale of 1 : 1000 . A planimeter set to read 60 cm² on a scale of 1: 200 was used to planimeter each area enclosed by a contour and the following readings were obtained :

Contour (m)	Revolutions
112	326,4
109	282,2
106	212,1
103	150,0
100	100,0

Calculate the volume of water to be contained in the dam using any two methods .

(15 marks)

QUESTION 6

The following levels were taken along a route on which a trench 1,380 m wide with vertical sides is to be cut and in which a concrete pipe 1020 mm internal diameter is to be laid at a down grade of - 1 : 250 from A to G . The bottom of the pipe is to be 1,820 m vertically below A . Take the reduced level of point A as 1350 m.

Station	Horizontal Distance from A(m)	B.S.	I.S.	F.S.
A	0	2,602		
B	18		1,908	
C	30		2,438	
D	56	1,902		2,188
E	72		1,872	
F	95	1,704		3,042
G	110			2,180

Calculate the volume of earth to be excavated .

(25 marks)

List of formulae

$$A = \frac{X \cdot Y^2 \cdot Z}{1002}$$

$$A = \frac{(b + sh)^2}{2(s - m)}$$

$$A = \frac{(b - sh)^2}{2(s - n)}$$

$$W_g = \frac{s(b + nh)}{s - n}$$

$$W_l = \frac{s(b + nh)}{s + n}$$

$$A = \frac{1}{2} [h + b/n] (W_l + W_g) - b^2/n$$

$$W_1 = \frac{s b + nh}{S - n}$$

$$W_2 = \frac{s b - mh}{s - m}$$

$$A_1 = \frac{(b + sh)^2}{2(s - n)}$$

$$A_2 = \frac{(b - sh)^2}{2(s - m)}$$

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

$$s = \frac{a + b + c}{2}$$

$$A = d/2 [O_1 + O_N + 2(O_2 + O_3 + \dots + O_{(N-1)})]$$

$$A = d/3 (X + 2O + 4E)$$

$$C_s = \frac{L_m (l' - l)}{L}$$

$$C_t = L_m (t_f - t_s) \alpha$$

$$C_i = L_m (1 - \cos \alpha)$$

L

$$C_T = \frac{T_f - T_s L_m}{A \times E}$$

$$C_c = \frac{(mg)^2 L_m^3}{24T^2}$$

$$V = d/2 [A_1 + A_N + 2(A_2 + A_3 + \dots + A_{(N-1)})]$$

$$V = d/3 [X + 2O + 4E]$$

$$V = \pi r^2 \times h/3$$

DIAGRAMS

Fig. 3

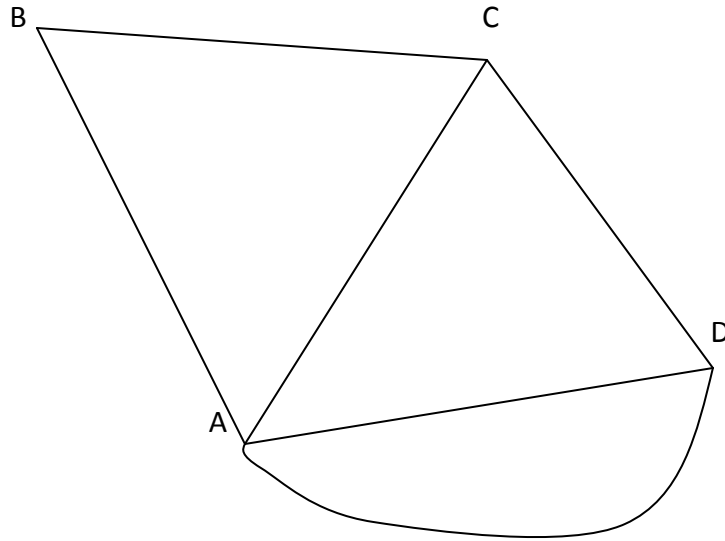


Fig. 5b

