KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2018

Marks Scored:

Level : B. E.
Year : II
Course : GEOM 201
Semester : I
Exam Roll No. :
Time: 30 mins.
F. M. : 10
Registration No.:
Date MAR: 0 7 2018

SECTION "A"
[20 Q. × 0.5 =10 marks]

1. The development of aerial photography begun in:
   a. 1800s b. 1700s c. 1900s d. 1400s

2. If distance is measured with EDM and angle is measured with compass for preparation of topographic map, which of the following rule does it violate?
   a. Whole to part
   b. Accuracy of work
   c. Consistency in work
   d. Economy of accuracy

3. Which of the following is carried out to provide a national grid of control for preparation of accurate maps of large areas:
   a. plane surveys
   b. geographical surveys
   c. geodetic surveys
   d. topographical surveys

4. Shrunk scale is given by:
   a. shrinkage factor × original scale
   b. shrinkage factor × new scale
   c. shrinkage factor / original scale
   d. shrinkage factor / new scale

5. _____is used to center a theodolite to an accuracy of 1-2mm.
   a. Cross staff b. Plumb bob c. Clinometer d. Abney Level

6. In the prismatic compass:
   a. The graduations have 0^0 at N and S and 90^0 at E and W
   b. Graduated ring is attached to the circular box
   c. Cannot be used without a tripod
   d. Observes WCB directly

7. Azimuth of a line is also known as:
   a. True bearing b. Magnetic bearing c. Grid bearing d. Arbitrary bearing

8. In theodolites, the difference should be 200 gon in case of:
   a. Horizontal angle b. Vertical angle c. Deflection angle d. Exterior angle

9. The size of the theodolite is determined by its:
   a. Diameter of vertical circle
   b. Diameter of horizontal circle
   c. Graduation of horizontal circle
   d. Graduation of vertical circle

10. The temperature correction for a tape is given by:
    a. $\alpha (T - T_s) L$ b. $\alpha (T + T_s) L$ c. $\alpha (T_s - T) L$ d. £ $(T - T_s) L$

11. The difference of levels between two stations A and B is to be determined. The instrument stations should be _____ for the best results.
    a. Equidistant from A and B
    b. Closer to the lower station
    c. Closer to the higher station
    d. As far as possible from the line AB

12. The length of the chain is measured from the:
    a. outside of one handle to the outside of another handle
    b. outside of one handle to the inside of another handle
    c. inside of one handle to the inside of another handle
    d. centre of one handle to the centre of another handle

13. A well-conditioned triangle should not have angles more than
    a. 30° b. 45° c. 120° d. 60°

14. Chain that consists of 100 links and is 66 ft long is:
    a. Surveyor's chain b. Engineer's chain c. Metric chain d. Revenue chain

15. It is more difficult to obtain good results while measuring horizontal distance by stepping:
    a. uphill b. downhill c. in low undulations d. in plane areas

16. If true bearing of a line is 10° and the magnetic declination is 3°W, its magnetic bearing is:
    a. 2° b. 12° c. 7° d. 13°

17. Some laser EDMs can measure distances without reflector for:
    a. 100-350 m b. 3-10 km c. 10-20 km d. 100-250 m

18. The following are features of cross section leveling except:
    a. intervals of cross section depends upon the topography
    b. plotted with different vertical and horizontal scales
    c. are short profiles made perpendicular to the centre line of the project
    d. Rod readings are taken at significant changes in the terrain

19. For a 100ft steel tape weighing 2 lb supported at the ends only with a 12 lb pull, the sag correction is :
    a. -0.115 ft b. 0.116 ft c. -0.116 ft d. 0.115 ft

20. The correction for length computed using wrong scale is:
    a. (R.F of correct scale / R.F of wrong scale) × measured length
    b. (R.F of wrong scale / R.F of correct scale) × derived length
    c. (R.F of correct scale / R.F of wrong scale) × deducted length
    d. (R.F of wrong scale / R.F of correct scale) × measured length

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SECTION "B"
(Short answer question)
[6 Q × 4 = 24 marks]

Attempt *ANY SIX* questions. Assume suitable data if necessary.

1. a. The elevation of 8,848 m (29,029 ft) was first determined by an Indian surveyor in 1955. Later, it was subsequently reaffirmed by a 1975 Chinese measurement 8,848.13 m (29,029.30 ft). In May 1999, an American Everest Expedition confirmed the rock head elevation of 8,850 m (29,035 ft). Write your view regarding this change in elevation of Mt. Everest, while measured by different parties. [2]
   b. Classify surveying based on instrument and purpose. List the types only. [2]

2. How do you determine the cross section area of a canal? Explain level loop adjustment in levelling. [2+2]

3. What do you mean by a well-conditioned theodolite? Briefly explain steps involved in temporary adjustment of theodolite. [2+2]

4. Distinguish between the following [2+2]
   a. Theodolite and tacheometer
   b. Plan and map

5. Write short notes on: [2+2]
   a. Planimeter
   b. Profile levelling

6. Define shrunk scale. A 20 m long tape of standard length at 84° F was used to measure a line. The mean temperature during the measurements was 65 °F. The measured distance was 882.10 meters with different slopes as per the following table: [1+3]

Slope	Distance measured
2°10'	100 m
4°12'	150 m
1°6'	50 m
7°48'	200 m
3°0'	300 m
5°10'	82.10 m

Find the true length of the line if the coefficient of expansion is 65×10^{-7} per 1°F.

7. a. The magnetic bearing of the sun at a place at noon in southern hemisphere is 167°. Calculate the magnetic declination. [2]
   b. For the given bearings measured with a compass, find the interior angles. [2]

Line	F.B.
AB	60 ° 30 '
BC	122 ° 0 '
CD	46 ° 0 '
DE	205 ° 30 '
EA	300 ° 0 '

SECTION "C"

(Long answer question)

[2 Q × 8 = 16 marks]

Attempt *ANY TWO* questions. Assume suitable data if necessary.

8. a. Define surveying and its principles. [4]
   b. Discuss the role of surveying in Geomatics. Explain the integration of Geomatics with various fields. [2+2]

9. a. Explain the different terms used in chain surveying. [4]
   b. A river is flowing from west to east. Two points A and B are selected on the southern bank such that AB = 100m. The point A is westwards. The bearing at a tree C on the northern bank are observed to be 4° and 34° respectively from A and B. Calculate the width of the river. [4]

10. a. Define local attraction. How is it detected and eliminated? [1+2]
    b. The following are bearings taken on a closed compass traverse: [5]

Line	F.B.	B.B.
AB	80°10'	259°0'
BC	120°20'	301°50'
CD	170°50'	350°50'
DE	230°10'	49°30'
EA	310°20'	130°15'

Compute the interior angles and correct them for observational errors. Assuming the observed bearing of the line CD is correct, adjust the bearing of the remaining sides.

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SECTION "A"
[20 Q × 1 = 20 marks]

Select the most appropriate answer:

1. The results of determination of molarity of a solution by four different methods are given as: 0.201, 0.203, 0.205 and 0.202. The median of the data set is
[ ] 0.2020 [ ] 0.2025 [ ] 0.2030 [ ] 0.2027

2. Barium sulfate is better precipitated in 0.01 to 0.05 M HCl. Which of the following condition is responsible for the favorable precipitation of $BaSO_4$?
[ ] High relative supersaturation
[ ] The solubility is increased by the formation of bisulfate ion
[ ] Homogenous precipitation
[ ] Digestion

3. What will be the molarity (in mol/ltr.) of a solution which contains 6.00 gm of NaCl in 200 ml of solution?
[ ] 0.213 [ ] 0.513 [ ] 12.06 [ ] 0.126

4. The value of ionic strength of 0.30 M Na_2SO_4 is
[ ] 0.9 [ ] 1.2 [ ] 0.3 [ ] 0.75

5. When 10.0 ml of 0.100 M HCl is titrated with 25.0 ml of 0.050 M NaOH, what will be the colour of solution when phenolphthalein is used as the indicator?
[ ] Pink [ ] Orange [ ] Colourless [ ] Yellow

6. Iodine is an example of .....indicator.
[ ] Acid base [ ] Metallochromic
[ ] Specific [ ] Adsoption

7. When 100 ml of 0.02 M NaCl is mixed with 25 ml of 0.1 M $AgNO_3$, the ion strongly adsorbed on primary layer of the precipitate is
[ ] Cl^- [ ] Ag^+ [ ] NO_3^- [ ] Na^+

8. The potential ,at equivalence point, for the following titration reaction is
$A^{2+} + 2B^{4+} \leftrightarrows A^{4+} + 2B^{3+}$ (E^0_A= 0.15V and E^0_B=1.44V)
[ ] 1.18V [ ] 0.58V [ ] 1.06V [ ] 0.76V

9. Which of the following statements are true?
A) The effective stability constant depends upon the pH
B) A Lewis acid is an electron donor
C) A Lewis base is an electron acceptor
D) α_4 increases as the pH increases
[ ] AB [ ] BD [ ] BC [ ] AD

10. Which of the following substance is nearly ideal for the preparation of a crystalline membrane electrode for the determination of fluoride ion?
[ ] Lanthanum fluoride [ ] Silver sulphide
[ ] Calcium dialkyl phosphate [ ] Calomel

Fill in the banks by most appropriate VALUE or WORD.

11. A side reaction in a titration is an example of_____ error.

12. The gravimetric factor for Fe in Fe_3O_4 is commonly written as_____.

13. The molar Y^{4-} concentration in a 0.0200 M EDTA solution buffered to a pH of 10.00 is _____(At pH 10.00, α_4=0.35).

14. A statistical method for determining the "best" straight line through a series of points is called as _____.

15. The process by which an impurity is deposited after precipitation of the desired substance is termed as _____.

16. The term **"m"** in the Ilkovic equation is _____ and it possesses the unit _____.

17. The potential of the saturated silver/silver chloride electrode at 25^0C is_____.

18. The cell: SCE||HP (0.010 M), NaP (0.040 M)|Pt, H_2 (1 atm) develops a potential of -0.591V. What will be the value of cathode potential? (potential for saturated calomel electrode at 25^0C is 0.2444V) _____.

19. A salt M^+A^- of 0.12 normality has specific conductance of 0.024 S cm^{-1}. Its equivalent conductance is_____.

20. _____is the difference between the experimental value and the true value.

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SECTION "B"
[5Q. × 5 = 25 marks]

Attempt *ANY FIVE* questions.

1. a) Give reasonable answer [3×1=3]
   (i) Multidentate ligands are preferable to unidentate ligands for complexometric titration
   (ii) Coprecipitation on gelatinous precipitate is pH dependent
   (iii) Some nitrobenzene is added to the solution in indirect estimation of chloride by Volhard method
   b) A student obtained the following result for the percentage purity of a sample: 10.30, 10.44, 10.38 and 10.34. What is the highest value a fifth result could be without being discarded by the Q-test? (At n=5, Q=0.64) [2]

2. a) Calculate the number of milliliters of ammonia (density 0.99 g/ml, 2.3% by weight NH_3), which will be required to precipitate as $Fe(OH)_3$ from the iron in a 0.70 g crude sample that contains 25%Fe_2O_3. (MW Fe_2O_3=159.69) [3]
   b) Calculate the pH of 0.050 M solution of acetic acid. The Ka of acetic acid is 1.8×10^{-5}. [2]

3. a) Draw a well labeled diagram of glass electrode. Write its working principle and cell representation for it. [3]
   b) A sample of copper ore weighing 2.132 gm is dissolved in acid and the copper is electrolyzed: $Cu^{2+} + 2e \rightarrow Cu$. [2]
   If 8.04 min is required for the electrolysis using a constant current of 2.00 A, calculate the percentage of copper in the ore. (AW Cu = 63.55).

4. a) With a labeled diagram of a typical polarogram, define residual current and half wave potential. [2]
   b) 50.0 ml of 0.100 M Fe^{2+} is titrated with 0.100 M Ce^{4+} in sulfuric acid solution. Calculate the potential of solution after addition of 10 ml, 50 ml, 70 ml of Ce^{4+} solution. (E^0Ce=1.44V , E^0Fe=0.68V) [3]

5. a) 50.0 ml of 0.010 M HA is titrated with 0.010 M strong base. Calculate the minimum value of K so that when 49.95 ml of titrant has been added, the reaction is essentially complete and the pH changes by 2.00 units on the addition of two more drops (0.10 ml) of titrant. [2]
   b) Calculate the volume of 0.0500 M EDTA needed to titrate 27.16 ml of 0.0741 M $Mg(NO_3)_2$. [3]

6. a) Calculate the value of K_{eff} for the reaction of Zn^{2+} with EDTA in a buffer of pH 9.0. Assume the concentration of free NH_3 in the buffer is 0.10 M. Given K1, K2, K3, K4 for the reaction of Zn^{++} with NH_3 be 190, 210, 250, 110 respectively. α_4 at pH 9.0 is 0.051 and K_{abs} is 3.2×10^{16}. [2]

b) Show how stepwise and overall formation constants are related. [3]

SECTION "C"

[5Q. × 6 = 30 marks]

Attempt *ANY FIVE* questions.

7. a) Explain clearly how to test two sets of results to determine if they are significantly different. [3]

b) What is von Weimarn theory of relative super saturation? [3]

8. a) What do you know about Gaussian distribution curve? [2]

b) Explain the reason of not adding too much buffer in EDTA titration. [2]

c) Write about Oxygen wave. [2]

9. a) What is the theory of acid base indicator? How are the indicators selected for titration? [3]

b) Differentiate between formality and molarity of a solution. What are the characteristics for the substance to be a primary standard? [3]

10. a) What is the optimum pH for EDTA titration? What happens if the pH is low or very high? At what condition K_{eff} approaches K_{abs}? How can you estimate anions like phosphate using EDTA titration? [4]

b) What are the metallochromic indicators? [2]

11. a) How Volhard method differs from Mohr method? Explain with suitable example. [3]

b) Write short note on amperometric titration. [3]

12. a) What is a reference electrode? Show the clear sketch and cell representation for the saturated calomel electrode. [3]

b) Derive a general equation for direct potentiometric determination of ions. [3]

13. a) What is conductometric titration? Explain conductometric titration curve for titration of weak acid with weak base. [3]

b) What is carbonate error? How carbonate error can be eliminated? Why HCl cannot be used to acidify $KMnO_4$? [3]