Khulna University of Engineering & Technology
Department of Building Engineering & Construction Management
B. Sc. Engineering 1st Year 1st Term Regular Examination, 2015
CE 1123
(Surveying)

Full Marks: 210   Time: 3 hrs

N.B.   i)   Answer any three questions from each section in separate script.
        ii)   Figures in the right margin indicate full marks.

Section – A

1. (a) Define the term "Surveying". Why surveying is important in any engineering project? (07

   (b) Distinguish between: (i) Plan and map; (ii) Check line and tie line; (iii) Well conditioned and ill conditioned triangles, (iv) Gunter's chain and engineering chain. (10

   (c) What is offset? What are the conditions to be fulfilled to draw a perpendicular offset? (06

   (d) A line was measured with an engineering chain at a temperature of 25.0 ^{0}C and pull of 9.50 kg. The measured length was 700 m. The temperature during measurement was 35.5 ^{0}C and the pull applied was 12.25 kg. Find the true length of the line, if the cross sectional area of the tape was 0.021 cm^2. The coefficient of expansion of the material of the tape per ^{0}C is 3.5 x 10^{-6} and modulus of elasticity of the material of tape is 2.1 x 10^6 kg/cm^2. (12

2. (a) Define leveling. What are the objectives of leveling? (05

   (b) Define the following terms: Datum line, Mean Sea Level, Geoid, Reduce Level, Line of Collimation, and Bench Mark. (09

   (c) What are the points to be considered by a staff man and level man? (07

   (d) The following consecutive readings were taken with a level and 5 m leveling staff on continuously sloping ground at a common interval of 20 m: 0.385; 1.030; 1.925; 2.825; 3.730; 4.685; 0.625; 2.005; 3.110; 4.485.
   The reduce level of the first point is 208.125 m. Ruleout a page of level field book and entre the above readings. Calculate the reduce leves of the points by rise and fall method also the gradient of the line joining the first and last points. (14

3. (a) State and derive the expression for parabolic rule for the area calculation. In which situation this rule is applicable or not directly? (09

   (b) Mention the name of instrument used for computation of area. (02

   (c) How can you eliminate error due to inclination of collimation line for the case "When the line of collimation is inclined upwards"? (09

   (d) For the residential support of BECM, KUET graduate a model town to be constructed. Let the model town 250 m long is 20 m wide at the formation level and has the side slope $2\frac{1}{2}$ to 1. The ground levels at every 50 m along the center line are as under: (15

Distance (m)	0	50	100	1500	200	250
R.L.'s (m)	105.8	120.5	115.0	109.5	116.5	150.7

The formation level at zero chainage is 101.0 and the plot has rising gradient

1 in 25. The ground is level across the center line. Calculate the volume of earthwork.

4. (a) Define contouring. What are the factors affecting contour interval? (06)

   (b) Describe characteristics of contour map. Draw a typical contour map for a hill and pond. (12)

   (c) Define plane table survey. When do you recommend it? State the advantages and disadvantages of plane table survey. (10)

   (d) Write short note on: Pacing or Steeping, Ranging rods, and Offset rods. (07)

Section – B

5. (a) Write down the purpose of the anallactic lens. How can you determine the tachometric constants? (09)

   (b) Derive the expression of distance and height for inclined sight when the staff is held vertical. (11)

   (c) Calculate the R.L. of station A, B and the distance AB and the gradient of line AB for the following observations. The tacheometer was fitted with an anallatic lens and the staff was held vertical. Take, k = 100. (15)

Tacheometer at	Staff at	Bearing observed at T	Vertical angle	Staff readings (m)
T	A	$120^0 15'$	$+7^0 35'$	1.410, 1.965, 2.520
	B	$206^0 15'$	$+4^0 10'$	1.655, 2.475, 3.295

6. (a) Prove, $\Delta_n = \Delta_{n-1} + \delta_n$; by Rankine's method of tangential angle, where the symbols bear their usual meanings. (10)

   (b) Define super elevation. Derive the expression of minimum radius of the curve for the vehicle to pass safety with the given speed in v highways and railways. (12)

   (c) Calculate the necessary data to set out a curve of 6 degree of curvature to connect the two roads by offsets from chord. The deflection angle is 36^0 and two roads intersect at chainage 2000 m. Take peg interval as 30 m. (13)

7. (a) Define: (i) Local attraction; (ii) Reduced bearing; (iii) Declination. (06)

   (b) Define closing error. Describe the graphical method for balancing the closing error. (09)

   (c) Calculate the independent co-ordinate of stations A, B, C and D of the closed traverse ABCDA from the following data: (20)

Side	AB	BC	CD	DA
Length (m)	300	900	600	850
Bearing	$260^0 15'$	$190^0 30'$	$80^0 45'$	$351^0 0'$

   (a) Define: (i) Flying height; (ii) Photo mosaic; (iii) Project surveying; (iv) House setting. (06)

   (b) Show that the height displacement of a point is proportional to its height above MSL and the distance of its top image from the plumb point. (09)

(c) Write short notes on GPS and GIS. What are the applications of remote (06) sensing?

(d) To find the elevation of the top of a tower of KUET, observations were made (14) from two stations P and R, 30 m apart. The horizontal angle measured at P between R and the top of the tower was $60^{0}30'$ and that measured at R between the top of the tower and P station was $68^{0}18'$. The angle of elevation to the top of the tower was measured to be 10.48^{0} at R and that was 10.17^{0} at P. Staff readings on BM when the instrument was at P = 1.969m and that with the instrument at R = 2.073 m. Calculate the elevation of the top of the tower of KUET if that of BM was 420 m.

Full Marks: 210   Time: 3 hrs

N.B.   i)   Answer any three questions from each section in separate script.
           ii) Figures in the right margin indicate full marks.

Section – A

1. (a) Distinguish between electronic and electrolytic conduction.   (06)

   (b) State the Kohlrausch's law of independent migration of ions. How can you   (12)
       determine the Λ_0 of weak electrolytes using this law?

   (c) What do you mean by asymmetric effect and electrophoretic effect? Write   (12)
       down the Debye-Huckel conductance equation for 1:1 electrolyte solution and
       make schematic plots of Λ vs $\sqrt{c}$ for Nacl and $AgNO_3$ solutions.

   (d) The resistance of an N/4 solution of a salt is found to be 2.5×10^2 ohms.   (05)
       Calculate the equivalent conductance of the solution. (Cell constant = 1.15
       cm^{-1})

2. (a) Draw and explain and electrochemical cell of Galvanic type. How would you   (10)
       determine whether a particular electrode will act as a cathode or the anode?
       Write down the sign convention and types of reaction of the cell at anode and
       cathode.

   (b) What is Quinhydrone electrode? How would you make this electrode for the   (10)
       determination of pH of a solution?

   (c) What is electrode potential? Write down the factors that affect the electrode   (10)
       potential.

   d) Calculate the emf of the Zn-Ag cell at 298 K when $[Zn^{+2}]$ = 0.2 M and $[Ag^+]$ = 2   (05)
      M. Given that E^0 of cell at 298 K is 1.56 V.

3. (a) What do you mean by corrosion and erosion? Discuss the factors that enhance   (08)
       the rate of corrosion in Khulna region.

   (b) What is corroded center? Discuss the electrochemical mechanism of corrosion   (10)
       with suitable diagram.

   (c) What do you mean by passivity of metal? Explain the active-passive behavior   (12)
       of metal with diagram.

   (d) Write a short note on a pitting corrosion.   (05)

4. (a) What are additive properties, constitutive properties and hydrophilic hydration?   (06)
       Explain them with examples.

   (b) What is parachor? How do you determine the chemical structure of quinone,   (10)

$C_6H_4O_2$ using parachor values? (Observed value = 237.0)

(c) What is viscosity? Discuss the experimental determination of viscosity by means of an Ostwald viscometer. (10)

(d) What is optical activity? Write down the cause of optical activity. (09)

Section – B

5. (a) What is Portland cement? Write down the general composition of Portland cement. (05)

(b) Discuss the different types of cement according different composition and mention their composition. (10)

(c) Briefly describe the wet process of manufacturing cement clinkers. (12)

(d) Classify raw materials of manufacturing Portland cement. Give a brief description of each class of raw materials with suitable example. (08)

6. (a) What do you mean by cement, white cement and concrete? (06)

(b) What is retarder? Why is it an essential ingredient of Portland cement? (06)

(c) Write a short note on setting and hardening of cement with chemical reactions. (10)

(d) Draw the flow chart diagram for the manufacture of cement in Chatak cement mill. (07)

(e) Write down the name and functions of common additives used in Portland cement. (06)

7. (a) What is degree of polymerization? Write down the difference between chain polymerization and step polymerization. (10)

(b) What do you mean by co-polymer? Write a short note on "Bio-degradable Polymer". (08)

(c) What do you mean by failure of paints? How will you avoided the failure of paints? (05)

(d) What is coating? Write the strategy used for metallic and non-metallic coating. (12)

8. (a) Explain the terms adsorption, adsorbent and adsorbate with suitable examples. (09)

(b) Deduce Langmuirs adsorption equation and discuss this equation for the limiting conditions of very low and very high pressure. (12)

(c) The adsorption process is exothermic – Explain. (06)

(d) Write down the application ion-exchange adsorption with suitable examples. (08)

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Math 1123
(Mathematics - I)

Full Marks: 210

Time: 3 hrs

N.B.　i)　Answer any three questions from each section in separate script.

　　ii)　Figures in the right margin indicate full marks.

Section – A

1.　(a)　Define limit of a function. Using the (ε, δ) definition of limit prove that (12)

$\underset{x \longrightarrow 2}{Lim}(x^3 - 3x + 7) = 9$.

　　(b)　A function $f(x)$ is defined as follow $f(x) = \dfrac{x^2 - 4}{x - 2}$; when $x \neq 2$ and 3 when (12)

$x = 2$. Show that $f(x)$ is discontinuous at $x = 2$. Define $f(x)$ in such a way that it will be continuous at $x = 2$.

　　(c)　If $f(x) = |x - 1| + |x + 3|$ then discuss the differentiability of the function at (11)

$x = -3$.

2.　(a)　Evaluate $\dfrac{dy}{dx}$ when $(\sin x)^{\ln x} + \sin^2(\cos^{-1} x) = y$. (11)

　　(b)　If $y = \tan^{-1}(\dfrac{x}{a})$, Find y_n. (12)

　　(c)　If $y = \sin\{a\ln(ax + b)\}$ then show that (12)

$(x + b)^2 y_{n+2} + (2n + 1)(x + b)y_{n+1} + (x^2 + a^2)y_n = 0$.

3.　(a)　If $u = \dfrac{x - y}{x + y} + \dfrac{y^2 - x^2}{x^2 + y^2}$ then show that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = 0$. (09)

　　(b)　Find the maximum and minimum value of $u = \dfrac{4}{x} + \dfrac{36}{y}$, where $y = 2 - x$. (13)

　　(c)　Expand $\tan x$ by using Maclaurin's series. (13)

4.　(a)　Write down five indeterminate forms. Evaluate $\underset{x \longrightarrow \infty}{Lim}(1 + x)^{\frac{1}{x}}$. (12)

　　(b)　Justify the validity of the Mean Value theorem for the function (10)

$f(x) = 3 + 2x - x^2$ in the interval $(0, 1)$.

　　(c)　Solve the triangle when, a = 28°25', b = 30°30'30" and c = 44°15'18". (13)

5. (a) Evaluate the following integrals: (i) $\int \dfrac{dx}{\sin x + \tan x}$ (ii) $\int \dfrac{2\sin x + 3\cos x}{7\sin x - 2cox}dx$. (22)

(b) Evaluate the following integrals: $\int_{0}^{a} x\sqrt{\dfrac{a^2 - x^2}{a^2 + x^2}}dx$. (13)

6. Evaluate any three of the followings: (35)

(a) $\int_{0}^{\frac{\pi}{2}} \dfrac{dx}{3 + 5\cos x}$ (b) $\int_{0}^{\pi} \dfrac{dx}{3 + 2\sin x + \cos x}$ (c) $\int_{-\infty}^{\infty} \dfrac{x}{x^4 + 1}dx$ (d) $\int_{0}^{\frac{\pi}{2}} \ln(1 + \tan\theta)d\theta$

7. (a) Find the reduction formula for $\int\cos^n x\,dx$ and hence find $\int\cos^4 x\,dx$. (12)

(b) Define Gamma and Beta function. Evaluate $\int_{0}^{1} x^2(1 - x)^{\frac{3}{2}}dx$. (10)

(c) (i) Find the arc length of the plane curve $x = \dfrac{1}{6}y^3 + \dfrac{1}{2y}$ on $y\varepsilon[1,2]$. (07)

(ii) Find the volume of a sphere of radius r. (06)

8. (a) Define periodic function and its period with an example. (10)

(b) Find Fourier series of $f(x) = x\sin x$ when $-\Pi < x < \Pi$. (12)

(c) If $f(x) = \begin{cases} 0 & \text{when } -2 < x < 0 \\ 1 & \text{when } 0 < x < 2 \end{cases}$, expand the function $f(x)$ in Fourier series. (13)

Ph 1123
(Physics - I)

Full Marks: 210   Time: 3 hrs

N.B.   i)   Answer any three questions from each section in separate script.
         ii) Figures in the right margin indicate full marks.

Section – A

1. (a) Discuss the essential requirements of a thermometer.   (10)

   (b) What is the basic principle of platinum resistance thermometer? Discuss the   (15)
        constructional details and working principle of this thermometer.

   (c) If the platinum thermometer is 50.25 ^{0}c when the temperature on the gas scale   (10)
        is 50.00 ^{0}c, what will be the temperature on the platinum scale corresponding
        to 150.00 ^{0}c on the gas scale?

2. (a) State the second law of thermodynamics. Describe Carnot's cycle and deduce   (15)
        the efficiency of an ideal heat engine.

   (b) Show that the entropy remains constant in a reversible process but increases   (10)
        in an irreversible process.

   (c) One gram molecule of a gas expands isothermally to four times its volume.   (10)
        Calculate the change in its entropy in terms of the gas constant.

3. (a) Explain what you understand by thermodynamics scale of temperature. Show   (10)
        that it agrees with an ideal gas scale. What is zero on its scale?

   (b) Starting from the first law of thermodynamics prove that $C_p - C_v = R$, where   (15)
        the symbols have their usual meanings.

   (c) 50 grams of water at 0 ^{0}c is mixed with an equal mass of water at 83 ^{0}c.   (10)
        Calculate the resultant increase in entropy.

4. (a) What is the difference between elastic body and plastic body? What is Young's   (10)
        modulus?

   (b) Drive an expression for the depression of a cantilever.   (15)

   (c) A uniform rigid rod 120 cm long is clamped horizontally at one end. A load of   (10)
        100 gm is attached to the free end. Calculate the depression of the end point.
        Given that the Young's modulus of the material of the rod is 1.013 x 10^{11}
        dynes/cm^2, g = 980 cm/sec^2 and the geometrical moment of the rod is 12.56
        cm^4.

Section – B

5. (a) Distinguish between free and forced vibration. Give the theory of forced   (15)
        vibration and discuss the conditions of resonance.

(b) Calculate the total energy of a body executing simple harmonic motion. (10)

(c) The force and displacement of a simple dynamic system is given by (10) $F = 10\sin(\frac{\Pi t}{10})$ newtons and $y = 0.9\sin(\frac{\Pi t}{10} - \frac{\Pi}{4})$ meters. Calculate the work done by the excitation force in i) 20 seconds and ii) 5 minutes.

6. (a) Deduce the differential equation $\frac{d^2 y}{dt^2} = v^2 \frac{d^2 y}{dx^2}$ for wave motion where the symbols have their usual meanings. (12)

(b) Describe briefly the properties of longitudinal progressive waves. Show that (13) the energy of a plane progressive wave is given by $E = 2\Pi^2 \rho n^2 a^2$.

(c) Proved that resonance R is inversely proportional to the frictional force μ. (10)

7. (a) What are stationary waves? Write down their properties. (10)

(b) Explain the terms: Reflection & Refraction of sound, Diffraction of sound, Echo (15) and whispering Galleries.

(c) A man standing between two parallel cliffs fires a gun. He hears one echo (10) after $1\frac{1}{2}$ sec, another $2\frac{1}{2}$ sec and a third one after 4 sec. If the distance between the two cliffs is 700 m. What is the velocity of sound and what is the distance of the man from one of the cliffs.

8. (a) What do you mean by reverberation and reverberation time? (10)

(b) Drive the expression of the growth and decay of sound intensity in an (15) auditorium and hence obtain Sabine's reverberation formula.

(c) Compare the acoustic intensities in air and in water for the same acoustic (10) pressure.

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B. Sc. Engineering 1st Year 1st Term Regular Examination, 2015
Hum 1123
(English)

Full Marks: 210   Time: 3 hrs

N.B.   i)   Answer any three questions from each section in separate script.
     ii)   Figures in the right margin indicate full marks.

Section – A

1.   (a)   Make W/H questions from the underline parts of the following answers.   (14)
    i) We want to go out <u>for a meal</u>.
    ii) I am going to <u>Dhaka</u> tomorrow.
    iii) I am going to Dhaka <u>tomorrow</u>.
    iv) The Police warned <u>the taxi driver</u>.
    v) I feel <u>feverish</u> today.
    vi) I found him <u>in the fair</u>.
    vii) I want to talk about <u>literature</u>.

    (b)   Transform the following sentences as directed.   (12)
    i) I am sure that he will succeed. (Simple)
    ii) Why did not they give the proof? (Passive)
    iii) No one will deny that he is brave. (Affirmative)
    iv) He is, at least, as wise as any other boy. (Comparative)
    v) His honesty is known to all. (Complex)
    vi) He escaped unhurt. (Interrogative)

    (c)   Make one sentence with each of the following phrases and idioms.   (09)
    Gala day; Palmy days; Red-type; A slow coach; Tall talk; Face to face.

2.   (a)   Make sentences using the following words as directed.   (14)
    School (as verb); School (as adjective); Still (as noun); Still (as adjective); Still (as verb); Still (as adverb); Still (as conjunction).

    (b)   Change the following words as directed and use the changed form in sentences.   (12)
    People (into verb); People (into noun); People (into adjective); People (into adverb); Blood (into verb); Drain (into noun).

    (c)   Correct the following sentences.   (09)
    i) He was died of fever.
    ii) Either of these three pens will do.
    iii) I know where does he live?
    iv) Let he and I go.
    v) Whole Bangladesh mourns for Bangabandhu.
    vi) Credit it in my name.

3.   (a)   Write sentences by using Modal auxiliaries to express each of the following.   (14)
    i) Something that you had the opportunity to do and you didn't
    ii) a guess about the future
    iii) a guess about the present
    iv) internal obligation

v) Strong possibility

vi) Unnecessary action in the past

vii) Duty in the past

(b) Make sentences in the following structures. (12)

i) Subject + Vit + Adverbial

ii) Subject + Linking verb + Adj. complement + extension

iii) Subject + Linking verb + Noun complement + extension

iv) Subject + vt + Infinitive as object

v) Subject + vt + object + Adjective complement + extension

vi) Subject + vt + object + Noun complement

(c) Define Participle, Gerund and Infinitive. Give two examples of each of them in sentences. (09)

4. (a) Make a new word with each of the following prefixes and suffixes and use them in sentences. (14)

Be......, Con......, De......, Fore......, ...luce, ...my, ...ster.

(b) Frame sentences expressing the following notions/ emotions. (12)

i) Annoyance; ii) Approval; iii) Disapproval; iv) Proposal; v) Introduction; vi) Apology.

(c) Supply a suitable word to fill in the blanks. (09)

i) I don't mind .... a cup of tea.

ii) The day .... fine, we started for a trip.

iii) I am sorry for keeping you ....

iv) He started early .... he should miss the train.

v) With .... did she go home?

vi) The doctor suggested that I .... give up smoking.

Section – B

5. (a) Read the following passage carefully and answer the questions that follow. (20)

The press, as identified with newspapers, fields immerses power in a democratic country. So great is its influence that some have called it the Fourth State. Ivapoleon used to say "Your hostile newspapers are more feared than a thousand bayonets". It is because the press forms opinions, creates movements and policies through well-informed criticism in a country. The most powerful autocrat is forced to take note of public instrument of autocracy. A free press is the symbol of a free people. An independent, well-informed press is a powerful check on arbitrary government and irresponsible administrators. For newspaper are agents of publicity, which bring to the notice of the people acts of injustice or oppression or maladministration that a government would otherwise have hidden away. They exercise constant vigilance on the rules, which is salutary for all. But now-a-days it is difficult for the press to be free. Either a newspaper is controlled by financial magnate, and it has to voice his views; or it is the mouth-piece of a party and it must think as the party is reduced. For whoever controls it, necessarily limits its freedom by his own needs and requirements. In America, the big newspapers are in the hands of powerful financial syndicates; in England, they are in the hands of the capitalists; in Russia, they are in the hands of the governments of course, it is maintained with some reason that a people's Government has greated right to control a private individual organization.

i. What role does a press play in a country?

ii. Why should we need freedom on press?

iii. How can injustice be removed with press?

iv. What are the bars to the freedom of press?

(b) Make a précis of the above written passage (Q. 5.a) with a suitable title. (15)

6. (a) Amplify the following idea (Around 1200 words). (20)

"Ignorance is the Curse of God."

(b) Make a dialogue between you and your teacher on the importance of learning (15) English. (Around 800 words)

7. (a) Write a listing paragraph on fast foods. (Around 1200 words) (20)

(b) Write a letter to the editor of a newspaper on the water pollution and the ways (15) to get rid of the problem. (Around 800 words)

8. Write a free composition on one of the followings. (Around 2000 words) (35)
a) National consciousness and environment.
b) The need for global peace.
c) Education in private universities.