

Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
 B. Sc. Engineering 1st Year 1st Term Regular Examination, 2019
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) Write down the characteristics of a closed traverse. (05)
 (b) Define closing error. Describe the graphical method for balancing the closing error. (10)
 (c) The following bearings were observed in a closed traverse ABCDEA. Calculate the independent co-ordinate of the stations. (20)

Side	Length (ft)	Forward Bearing	Backward Bearing
AB	100	60°30'	240°30'
BC	142	120°0'	302°10'
CD	110	46°0'	225°50'
DE	112	205°30'	25°20'
EA	115	300°0'	120°15'

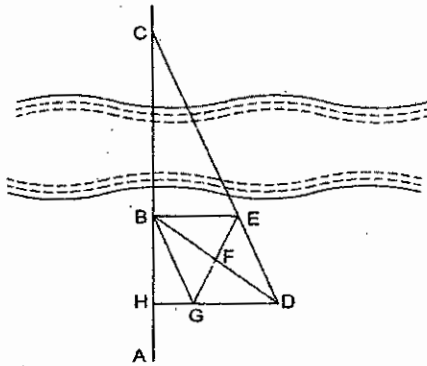
2. (a) Write short notes on anallactic lens and house setting. Describe the procedure of house setting in the field. (10)
 (b) Define tacheometry. What are the tacheometry constants? How are they determined? (10)
 (c) Determine the gradient from a point P to another point Q from the following observations made with tacheometer fitted with an anallactic lens. The constant of the instrument was 100 and the staff was held vertically. (15)

Instrument station	Staff station	Bearing	Vertical angle	Staff reading (m)
R	P	130°	+10°32'	1.255, 1.810, 2.365
	Q	220°	+5°06'	1.300, 2.120, 2.940

3. (a) Define (i) Aerial photogrammetry (ii) Local attraction (iii) Nadir point (iv) Flying height (v) Inclination (vi) Magnetic bearing (15)
 (b) Show that the height displacement of a point is proportional to its height above MSL and the distance to its top image from plump point. (10)
 (c) Photographs at a minimum scale of 1:6000 are to be taken for a border road design map of a hilly area having elevation ranges from 160 m to 2000 m. If the focal length of the camera lens is 140 mm, what is the flying height of the aircraft above MSL? What will be the smallest scale? (10)
4. (a) Write short notes on remote sensing and photo mosaic. What are the advantages and disadvantages of photo mosaic? (10)
 (b) Mention the important operations of total station in surveying. What are the advantages of using total station over other conventional surveying instrument? (10)
 (c) To find the elevation of the top of the minar of KUET mosque, observations were made from two stations P and R, 50 m apart. The horizontal angle measured at P between R and the top of the minar was 60°45' and that measured at R between the top of the minar and P station was 72°30'. The angle of elevation of the top of the minar was measured to be 20°17' at R and that was 20°48' at P. Stadia readings on B.M. when the instrument was at P = 2.969 m and that with the instrument at R = 3.073 m. Calculate the elevation of the minar of KUET mosque if that of B.M. was 420 m. (15)

Section – B

5. (a) Define the term " Reconnaissance Survey". Why surveying is important in building engineering sector? (05)
- (b) Two stations A and B are not intervisible due to rising ground between them. Explain with a sketch how the line AB can be ranged if both the stations are visible from intermediate points. (10)
- (c) Deduce and explain Simpson's one third rule with neat sketch. (12)
- (d) A survey line ABC cuts the banks of a river at B and C and to determining the distance BC, a line BE, 60 m long was set out roughly parallel to the river. A point D was then found in CE produced and middle point F of DB determined. EF was then produced to G making FG equal to EF and DG produced to cut the survey line in H. GH and HB were found to be 40 and 80 meters long respectively. Find the distance from B to C. (08)



6. (a) Define levelling. What are the points to be considered by a staff man and level man? (10)
- (b) Define the following terms- (i) Datum Line (ii) Mean Sea Level (iii) Bench Mark (iv) Line of Collimation (v) Reduce Level (10)
- (c) The following consecutive readings were taken with a level and a 4 m levelling staff on a continuously sloping ground at common intervals of 30 m. (15)
 0.855 (on A), 1.545, 2.335, 3.115, 3.825, 0.455, 1.380, 2.055, 2.885, 3.455, 0.585, 1.015, 1.850, 2.755, 3.845 m (on B).
 The instrument was shifted after 5th & 10th readings. The RL of A was 380.500 m. Calculate the RLs of all point by using Height of Instrument (HI) method and apply the usual checks. Also determine the gradient of AB.
7. (a) Describe prismoidal formula for calculating the volume of earth work. (12)
- (b) Distinguish between trapezoidal rule and Simpson's rule. (05)
- (c) A railway embankment of formation width of 8 m and side slope 2:1 is to be constructed. The ground level along the centre line is as follows- (18)
- | | | | | | | |
|------------|--------|--------|--------|--------|--------|--------|
| Chainage - | 0 | 50 | 100 | 150 | 200 | 250 |
| GL (m) - | 115.75 | 114.35 | 116.80 | 115.20 | 118.50 | 118.25 |
- The embankment has a rising gradient of 1:100, and the formation level across the centre line. Compute the volume of earth work.
8. (a) When do you recommend plane table survey? State the disadvantages of it. (06)
- (b) Define GPS & GIS. Write down the application of GPS. (06)
- (c) Describe the characteristics of contour map. Draw a typical contour map for a hill and pond. (12)
- (d) What is orientation? What are the methods of orientation? Describe the methods with a sketch. (11)

Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
B. Sc. Engineering 1st Year 1st Term Regular Examination, 2019
Ch 1123
(Chemistry)

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) Write down the charge and discharge reaction of Li-ion battery. How does the battery develop voltage? (07)
- (b) Explain graphically the weak acid versus strong base conductometric titration. What are the advantages of conductometric titration over ordinary titration? (10)
- (c) What do you mean by Relaxation effect and Electrophoretic effect? Write down the Debye-Huckel on a gas conductive equation for electrolyte solution and make a schematic plot of A vs \sqrt{c} for KCl and AgNO₃ solution. (10)
- (d) What is salt-bridge? How does it work? (08)

2. (a) Construct a cell of the followings with proper notation and cell reaction; and find out the *emf* of the cell: (12)
(i) Cu²⁺(1M), Cu(s); pt(s), H⁺(1M), H₂(1 atm)
(ii) Zn(s), Zn²⁺(1M); H⁺(1M), H₂(1 atm), pt(s)
(iii) Cu²⁺(1M), Cu(s); Zn(s), Zn²⁺(1M)
Establish the graphical relation between E_{cell} and $\log K$ for the above Zn-Cu cell and indication from the graph when the cell can do more work. Explain the significance of K value of Zn-Cu cell reaction ($E_{Zn^{2+}/Zn}^0 = -0.76$ V and $E_{Cu^{2+}/Cu}^0 = +0.34$ V).
- (b) How pH of a solution is determined by using hydrogen electrode? (09)
- (c) Explain the interrelationship of ΔG^0 , E_{cell}^0 and K . From the relation, explain when the electrode reaction will be spontaneous, non spontaneous or equilibrium. (10)
- (d) Distinguish between electronic and electrolytic conduction. (04)

3. (a) What is atmospheric corrosion? Discuss the factors that enhance the rate of corrosion in Khulna region. (10)
- (b) What is corroded centre? Discuss the effect of electrolytes and pH on the rate of underwater corrosion. (10)
- (c) What is sacrificial anode? Explain the anodic and cathodic protection of corrosion. (10)
- (d) Write a short note on "Corrosion Fatigue". (05)

4. (a) Why does adsorption occur on the surface of a solid or liquid? (07)
(b) Write down some differences between physical and chemical adsorption. (09)
(c) Deduce Langmuir adsorption isotherm of a gas-solid system. (11)
(d) Write a short note on the application of adsorption in our daily life. (08)

Section – B

5. (a) Why all macromolecules are not polymer? (08)
(b) Whether polyacetylene is a conducting polymer or not? Justify. (07)
(c) Describe the mechanism of cationic polymerization process. (12)
(d) A polymer sample consists of 9 moles having molecular weight 30,000 and 5 moles having molecular weight 50,000. Proof that $\overline{M}_w > \overline{M}_n$. (08)
6. (a) Differentiate between paint and varnish. (07)
(b) Describe the mechanism of drying oils during the film formation of surface coatings. (12)
(c) How can you remove fatty and mineral oils from the metal surface? (09)
(d) Write down the characteristics of a good pigment for the preparation of a paint. (07)
7. (a) What is Portland cement? Why the name 'Portland cement' was given to the ordinary cement? (07)
(b) Write down the flow chart for the manufacturing of Portland cement. (07)
(c) Write down different types of ordinary Portland cements. Why these are called ordinary Portland cements (OPC). Type (II) and V OPC are designed to be resistant to sulfate attack. How? (15)
(d) Tricalcium aluminate in the Portland cement is responsible for initial set. Why? (06)
8. (a) Describe the process parameters for manufacturing a good quality of cement clinker. (09)
(b) Why vulcanized rubber has high tensile strength. (07)
(c) Define physical properties of species. Give some physical properties of a species. (07)
(d) Write down some characteristics and function of vehicle for surface coating. (12)
-

Khulna University of Engineering & Technology
 Department of Building Engineering & Construction Management
 B. Sc. Engineering 1st Year 1st Term Regular Examination, 2019
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 continuity of a function. A function $f(x)$ is defined as follows; (12)

$$f(x) = \begin{cases} \frac{x^2-16}{x-4} & \text{when } x \neq 4 \\ 6 & \text{when } x = 4 \end{cases}$$

Discuss the continuity of $f(x)$ at $x = 4$. If the function $f(x)$ is discontinuous, the how can you make this function continuous at $x = 4$?

- (b) A function $f(x)$ is defined as follows; (12)

$$f(x) = \begin{cases} 1 + \sin x & \text{for } 0 \leq x < \frac{\pi}{2} \\ 1 & \text{for } 0 > x \\ 2 + \left(x - \frac{\pi}{2}\right)^2 & \text{for } x \geq \frac{\pi}{2} \end{cases}$$

Discuss the differentiability of $f(x)$ at $x = \frac{\pi}{2}$

- (c) Write down the distinction between $\lim_{x \rightarrow a} f(x)$ and $f(a)$. Find the differential (11)

coefficient of $\tan^{-1}\left(\frac{a+x}{1-ax}\right)$ with respect to x .

2. (a) If $y = e^{bx} \cos ax$, find y_n . (10)

- (b) State Leibnitz's theorem. If $y = a \cos(\log x) + b \sin(\log x)$, then find y_{n+2} by using Leibnitz's theorem. (13)

- (c) If $W = f\left(\frac{y-x}{xy}, \frac{z-y}{yz}\right)$, then find the value of $x^2 \frac{\partial W}{\partial x} + y^2 \frac{\partial W}{\partial y} + z^2 \frac{\partial W}{\partial z}$. (12)

3. (a) Define maximum of a function. Find the maximum value of a function $\left(\frac{1}{x}\right)^x$. (12)

- (b) State Rolle's theorem. Expand $x^3 - 3x^2 + 7x + 2$ in powers of $(x - 2)$. (10)

- (c) Write the indeterminate forms. Evaluate $\lim_{x \rightarrow 0} \left(\frac{\tan x}{x}\right)^{\frac{1}{x}}$ (13)

4. (a) Define spherical triangle. Derive the following formula for a spherical triangle ABC : $\cos b = \cos c \cdot \cos a + \sin c \cdot \sin a \cdot \cos B$ where a, b, c are sides and B is an angle of the spherical triangle ABC . (13)

- (b) Given $a = 86^{\circ}6'$, $\angle B = 43^{\circ}28'$ and $\angle C = 90^{\circ}$ (10)
 solve the spherical triangle ABC .
- (c) Find the great circle distance from Boston ($42^{\circ}22'N, 71^{\circ}4'W$) to Wellington (12)
 ($41^{\circ}8'S, 174^{\circ}46'E$) in nautical miles.

Section – B

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

(i) $\int (3x - 1)\sqrt{x^2 - x + 1} \, dx$

(ii) $\int \frac{3\sin x - 4\cos x - 5}{2 - \cos x - 2\sin x} \, dx$

(iii) $\int \frac{dx}{5 + 4\cos x}$

(iv) $\int e^{2x} \left(\frac{1 + \sin 2x}{1 + \cos 2x} \right) \, dx$

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

(i) $\text{Lt}_{n \rightarrow \infty} \left[\frac{1}{n} + \frac{n^2}{(n+1)^3} + \frac{n^2}{(n+2)^3} + \dots + \frac{1}{8n} \right]$

(ii) $\int_0^{\pi} \frac{x \sin x}{1 + \cos^2 x} \, dx$

(iii) $\int_0^1 x^3 (1 - x^2)^{\frac{3}{2}} \, dx$

(iv) $\int_0^{\frac{\pi}{2}} \log \cos x \, dx$

7. (a) Define Beta function and Gamma function. Establish the relation between Beta function and Gamma function. (13)

(b) Determine the length of the arc of the parabola $y^2 = 4ax$ cut off by the line $3y = 8x$. (12)

(c) Find the area bounded by the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = 2^{\frac{2}{3}}$ (10)

8. (a) Find the volume of the solid produced by the revolution of the loop of the curve $9y^2 = x(3 - x)^2$ about the x -axis. (11)

(b) Define periodic function with an example. (13)

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

(c) Expand $f(x) = x$; $0 < x < 2$ in a half-range Fourier sine series. (11)

Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
B. Sc. Engineering 1st Year 1st Term Regular Examination, 2019
Ph1123
(Physics-I)

Full Marks: 210

Time: 3 hrs

- N.B.** i) Answer any three questions from each section in separate script.
ii) Assume reasonable values for any missing data.

Section – A

1. (a) What is simple harmonic motion? Derive an expression for total energy of simple harmonic motion and show that the average kinetic energy and average potential energy are equal. (13)
- (b) Show that the superposition principle is valid only in case of linear homogeneous equation. (12)
- (c) The force and displacement of a simple dynamic system undergoing sinusoidal excitation are given by the equations $F = 2 \sin\left(\frac{\pi t}{3}\right)$ newton's and $Y = 3 \sin\left(\frac{\pi t}{3} - \frac{\pi}{4}\right)$ meters. Calculate the work done by the excitation force in (i) 6 sec. and (ii) 10 minutes. (10)

2. (a) The differential equation of damped harmonic oscillator is $\frac{d^2x}{dt^2} + 2\lambda \frac{dx}{dt} + \omega^2x = 0$, find the power dissipation of this damped harmonic oscillator. (15)
- (b) Show that LCR circuit behaves as a damped harmonic oscillator. (10)
- (c) Deduce the frequency and quality factor for a circuit with $L = 2$ mH, $c = 5$ μ F and $R = 0.020$ Ω . (10)

3. (a) For a plane progressive wave, show that $\frac{d^2y}{dt^2} = v^2 \frac{d^2y}{dx^2}$; where symbols have their usual meanings. (10)
- (b) Show that there is no transference of energy across any section of the medium in core of a stationary wave. (15)
- (c) A source of sound has a frequency of 510 Hz and amplitude of 0.22 m. What is the flow of energy across a square cm per second if the velocity of sound in air is 330 m/s and the density of air is 0.00129 gm/cm³. (10)

4. (a) Discuss acoustics. Discuss acoustic intensity level and acoustic pressure level. (10)
- (b) Derive an analytical expression for the growth and decay of sound intensity inside an auditorium and hence obtain sabines reverberation formula. (15)
- (c) A room dimensions 12 x 8 x 10 meters. Calculate (i) the mean free path of the sound wave in the room and (ii) the number of reflections made per second by the sound wave with the walls of the room. Velocity of sound in air = 320 m/s. (10)

Section – B

5. (a) What is thermo couple? Explain neutral temperature and temperature of inversion. (10)
- (b) Describe and explain the cylindrical shell method of determining the conductivity of a solid. (10)
- (c) Two plates of the same dimensions but of different thermal conductivities k_1 and k_2 (15) are welded together to form a single plate of double thickness. Show that the equivalent thermal conductivity K is given by,

$$K = \frac{2k_1k_2}{k_1 + k_2}$$

6. (a) Describe the principle, construction and working of a platinum resistance thermometer. (15)
- (b) Show that adiabatic curve is steeper than an isothermal curve. (10)
- (c) Show that the work done in adiabatic expansion of an ideal gas from a state (P_1, V_1) to a state (P_2, V_2) is given by, (10)

$$W = \frac{1}{\gamma - 1} [P_1 V_1 - P_2 V_2]$$

7. (a) What is entropy? What happens to change in entropy of a system which undergoes an irreversible process? Explain briefly. (10)
- (b) Derive the expressions for the change in entropy of a gas when it is heated in a general manner. (15)
- (c) Find the work necessary to compress one liter of oxygen to one – tenth of its volume the process being conducted isothermally at 0°C from the initial pressure of 1 atmosphere. What work the gas would do if it were expanded adiabatically to its original volume. ($\gamma = 1.4$) (10)
8. (a) If Y , K , η and σ represent Young's modulus, Bulk modulus, Modulus of rigidity and Poisson's ration of a substance, then derive the relationships connecting (i) Y , K and σ (ii) K , η and σ . (15)
- (b) Show that the excess pressure inside a soap bubble of radius r over the atmospheric pressure outside is equal to $\frac{4T}{r}$, where T is the surface tension of soap solution. (10)
- (c) A cantilever of length 50 cm is depressed by 15 mm at the loaded end. Calculate the depression at a distance of 30 cm from the fixed end. (10)
-

Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
B. Sc. Engineering 1st Year 1st Term Regular Examination, 2019
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 sentence with the following structures using the words given in brackets: (14)
- (i) Subject + Verb + Object + Adverb. (Avoid as verb)
 - (ii) Subject + Linking Verb + Adj. complement. (Appear as verb)
 - (iii) Subject+ Intransitive Verb + Adv. (Sleep as verb)
 - (iv) That + Subj. + Verb + Adv. of manner + Verb + Adj. complement. (Speak and look as verb)
 - (v) Since + Subj. + Verb + Adv. of manner, subj. + Verb + Adv. (Study and fail as verb)
 - (vi) Neither + Subj. + nor + Subj. + Verb + Adv. (Contribute as verb)
 - (vii) Subj., + relative Pronoun as Subj. + Verb+ Adv. +Verb+ Noun complement. (Study and is as verb)
- (b) Change the following words as directed and make sentences with the changed words. (12)
- Long (into verb); Blood (into verb); Waste (into noun); Strong (into noun); Man (into adjective); Mouth (into adjective); Intricate (into noun)
- (c) Make sentences using the following phrases and idioms: (09)
- Adhoc; At large; Bad blood; Hard and fast; Ins and out; Maiden speech.
2. (a) Frame wh questions from the underlined parts of the following answers: (14)
- (i) We worship God.
 - (ii) The Minister visited the college.
 - (iii) The boy shouted for help.
 - (iv) Open fresh air is good for health.
 - (v) I was annoyed with him.
 - (vi) The man was set free for his innocence.
 - (vii) He drives car seventy km per hour.
- (b) Make use of the following words in sentence as asked in brackets: (12)
- Access (as verb), Bad (as adv.), As (as conjunction), Baby (as verb), Cache (as verb), Cloud (as verb).
- (c) Identify the parts of speech of the underlined words of the following sentences: (09)
- (i) As I am ill. I cannot go.
 - (ii) I look for help from above.
 - (iii) Come back as soon as possible.
 - (iv) He stood before me.
 - (v) They fast every Thursday.
 - (vi) He led me wrong.

3. (a) Transform the following sentences as directed.
- | | |
|--|-----------------|
| (i) Did you sent the book? | (passive) |
| (ii) He is accused of theft by his friends. | (complex) |
| (iii) We are extremely sorry at his death. | (complex) |
| (iv) If you prick us, we shall react. | (interrogative) |
| (v) He died in the village where he was born. | (simple) |
| (vi) He sold the car that belonged to his brother. | (compound) |
| (vii) It is better to starve than to beg. | (positive) |
- (b) Make sentences using the following Modals as directed. (12)
- May (To express guess about the future)
 - Must (To express internal obligation)
 - Could (To express opportunity in the past which was not executed)
 - Should (To express duty in the past)
 - Need (To express unnecessary action in the present)
 - Be to (To express command)
- (c) Write two antonyms for each of the following words and use the antonyms in sentence. (09)
- Ignorance, Honesty, Labourious.
4. (a) Correct the following: (14)
- We usually write by pen.
 - We should not hanker for money.
 - He is in hurry.
 - How good man he is!
 - Tell me why are you not reading your lesson?
 - I will see their answer scripts.
 - Labu likes vegetable.
- (b) Make sentences expressing the following notions/ emotions. (12)
- Approval
 - Annoyance
 - Introduction
 - Regret
 - Good wish
 - Suggestion
- (c) Define Gerund, Infinitive and Present participle with two examples for each of the definitions. (09)

Section – B

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

The U. N. in idealistic point of view aims at keeping the ambiance of peace throughout the world, where the world leaders of the time in 1945, when the U. N. was born with different ideas of rule of law all over the world, think that for some in considerate events for example the world war (I) and (II), the peace, prosperity, and progress of the world may be at risk. They so consider that there is immediate necessity for the existence of an association, which will look after the peace, prosperity and progression of the nations of the world. With this view the U. N. came in existence. It has, as it cares for the progression of the world, different organs of existence as for example Education, Culture, Heritage Peace keeping Unit, Environment, Health, etc. It nourishes the hope in the nations of the world that through education the expected development of the world may be possible to achieve. Also the intellectual attitude of the nations will go forward as a human being, not as a beast. Next to these options of life peace, environment, health issues, etc. will not encounter any hazard. But it remains the beacon of hope only. Realistically what happens in spheres of life of the nations creates a pathetic scene. Does the education of the nations create envy, economic colonization, slavitude etc.? Do we hope so culture that we are not human beings in terms of fraternity? Environment of the world faces a catastrophic processes. But the world's association – The U. N. was born with a dignified object – man is the measure of all things.

Questions:

- (i) What is the background - the U. N. was born?
 - (ii) What are the objects – does the U. N. nurture?
 - (iii) What do the organs of the U. N. play roles?
 - (iv) Which fears do we claim in spite of the great aim of the U. N.?
- (b) Make a précis of the above written passage (Q.5. a) with a suitable title. (15)
6. (a) Amplify the idea – “Morning shows the day”. (20)
- (b) Write a paragraph on seasonal fruits. (15)
7. (a) Suppose a leading Real Estate Company is looking for some young, smart field Engineers. Now write an application and prepare a CV for the post. (20)
- (b) Write a letter to the editor of a newspaper regarding high prices of commodities. (15)
8. Write a free composition on any one of the following. (35)
- (a) Bribery: a social problem in Bangladesh.
 - (b) Patriotism and the development of a country.
-