Khulna University of Engineering & Technology

Department of Building Engineering and Construction Management

B. Sc. Engineering 1st Year 1st Term Regular Examination, 2018

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) What do you mean by surveying? Why surveying is so significant in any construction engineering project? (08)

   (b) What is reconnaissance survey? Why it is so important? Mention its advantages and disadvantages. (08)

   (c) A steel tape of 25 m long standardized at 63 °F with a pull of 12.5 kg was measured for measuring a base line. Find the correction per tape length if the temperature at the time of measurement was 85 °F and the pull exerted was 19.5 kg. Weight of steel = 8.16 gm/cm^3, weight of tape = 0.09 kg and E = 200 Gpa. Take the coefficient of expansion of tape per 1 °F = 6.25 x 10^{-6}. (14)

   (d) Distinguish between: (i) Plan and map; (ii) check line and tie line. (05)

2. (a) Write short notes on: (i) Pacing or stepping, (ii) Pegs and Arrows, (iii) Ranging rods and offset rods. (09)

   (b) Write down the aims of leveling. Define the following terms: (i) Bench Mark, (ii) Datum, (iii) R.L. (iv) Mean Sea Level and (v) Station. (09)

   (c) The following staff readings were observed successively with a level, the instrument having been moved after third, fifth, eighth and tenth readings: 2.180; 1.606; 1.200; 2.090; 2.860; 1.362; 0.802; 1.982; 1.042; 2.689; 2.00; 2.240 meters. Enter the above readings in a page of a level book and calculate the R.L. of points, if the first reading was taken with a staff held on B.M. of 224.380 m. (17)

3. (a) What is contour and contour map? What are the factors affecting contour interval? (08)

   (b) Briefly describe the characteristics of contours. (08)

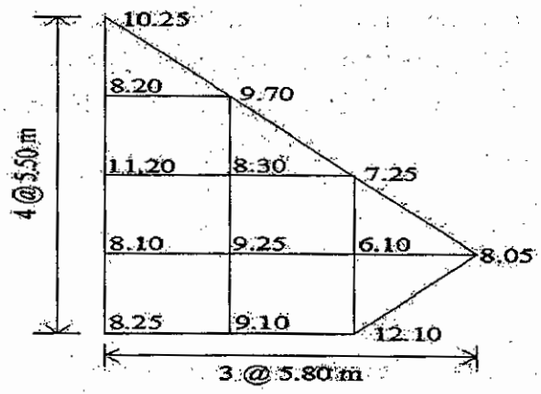
   (c) What is plane table surveying? Mention the instruments used in plane table survey. What are the methods used in plane table survey? Briefly describe one method from them. (14)

   (d) Illustrate the precautionary measures should be taken while performing field work of plane table surveying. (05)

4. (a) State Simpon's one third rule and derive it with net sketches. (09)

   (b) A series of offsets were taken from a chain line to a curved boundary line at intervals of 20 meters in the following order: 0, 2.65, 3.90, 3.15, 4.25, 3.50, 4.80, 5.50 m. Compute the area by using (a) Trapezoidal rule and (b) Simpson's rule. (11)

   (c) Find the amount of earthwork with respect to lowest R.L. of the plot of the land shown in figure below. (15)



Section – B

5. (a) Define traverse survey. Why it differs from chain survey? (05)

   (b) Define closing error. Describe the graphical method for balancing the closing error. (10)

   (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 (ft)	300	900	600	850
Bearing	260°15'	190°35'	80°50'	351°0'

6. (a) Write short notes on anallactic lens and house setting. Write down the procedure of house setting in the field. (10)

   (b) Derive an expression of distance and height for inclined sight when the staff is held vertical. (10)

   (c) Calculate the R.L. of station A, B, distance AB and the gradient of AB line from the following observations. The tacheometer is fitted with an anallactic lens and the staff is held vertical. Assume, k = 100 and R.L. of station O is 150 m. (15)

Instrument Station	Height of Instrument (m)	Staff Station	W.C.B	Vertical angle	Staff readings (m)
O	1.550	A	30°30'	4°30'	1.155, 1.755, 2.355
		B	75°30'	10°15'	1.250, 2.00, 2.750

7. (a) Write short notes on (i) aerial photogrammetry (ii) photo mosaic (iii) flying height (iv) project surveying (v) errors in surveying (vi) local attraction. (18)

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

   (c) Photographs at a minimum scale of 1:10000 are to be taken for a road design map of a hilly area having elevation ranges from 300 m to 500 m. If the focal length of the camera is 150 mm then what will be the flying height of the aircraft above MSL? What will be the largest scale? (08)

8. (a) Write short notes on (i) remote sensing (ii) GPS (iii) GIS with application. (09)

   (b) Mention the important operations of total station in surveying. What are the advantages of using total station over other conventional instruments? (10)

   (c) To find the elevation of top of a tower of KUET, observations were made from two stations P and R, 30 m apart. The horizontal angle measured at P between R and top of the tower was 60°15' and that measured at R between top of the tower and P station was 68°20'. The angle of elevation was measured 10°45' at R and 10°20' at P. Staff readings on BM when the instrument was at P = 1.969 m and at R = 2.073 m. Calculate the elevation of top of the tower of KUET if BM was 200 m. (16)

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B. Sc. Engineering 1st Year 1st Term Regular Examination, 2018

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) Show graphically the variation of equivalent conductance against $\sqrt{C}$ for Kcl and C_2H_5COOH. Explain the nature of the curves. (10)

   (b) State the Kohlrausch's law. How can you determine the no of weak electrolytes using this law? (10)

   (c) How pH of a solution is determined by using quinhydrone electrode? (10)

   (d) Calculate the equivalent conductance of 2N strong electrolyte solution. Given that cell constant=1.15 cm^{-1} and R=2.5x10^3 ohms. (05)

2. (a) Describe the models of electrical double layer at the interface. Distinguish between thermodynamic potential and electro-kinetic potential from the double layer mechanism. (10)

   (b) Establish thermodynamically the relationship between E and K of cell reaction. Explain the significance of this relation. (10)

   (c) What is electrochemical series? Discuss its application. (10)

   (d) The emf of the following cell at 298K is 0.445v pt, H_2(1atm) I H^+ II Kcl (sat, soln.) I Hg_2cl_2 I Hg. Calculate the pH of the unknown solution ($E_{cal.}$ = 0.2415 v). (05)

3. (a) What is atmospheric corrosion? Write down the effect of humidity and dust particle on the rate of corrosion. (10)

   (b) Discuss the electrochemical mechanism of corrosion. (10)

   (c) What is pitting? How is it formed? Discuss the disadvantages of pitting corrosion over other forms of corrosion. (10)

   (d) Write a short note on passivity of metal. (05)

4. (a) 'The adsorption process is exothermic'-Explain. (07)

   (b) Deduce Langmuir adsorption equation and discuss in the limiting conditions of very low and very high pressure. What is the limitation of their isotherm? (12)

   (c) Explain why a solid surface adsorbs gaseous or liquid molecule? (08)

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

Section – B

5. (a) What is PVC? State the ideal characteristics of an ideal paint. (06)
   (b) Describe pretreatment process of the surface or material for coating. (11)
   (c) Galvanizing is preferred to tinning, why? (08)
   (d) Define pigment and vehicle. Write down their characteristics and function for surface coating. (10)

6. (a) What is the principle of electroplating to provide a metallic coating over a metal? (06)
   (b) Discuss the application of electroplating. (10)
   (c) Explain the mechanism of drying oil on painting a surface. (12)
   (d) What are the main defects of a paint? (07)

7. (a) What is polymer? Distinguish between homo-polymer and co-polymer. (10)
   (b) Discuss the reaction mechanism of free radical polymerization. (08)
   (c) List out and discuss about the physical and chemical properties of a liquid system. (10)
   (d) Calculate the weight average molecular weight of a sample of polyester having 1200 molecular of 6000, 1500 molecules of 7000 and 2000 molecules of 800 molecules weight. (07)

8. (a) What are calcareous and argillaceous materials? Give examples of those classes of materials. (10)
   (b) Write down the flow chart of wet process for manufacturing cement. (10)
   (c) Discuss the effect of rate of cooling on the quality of cement manufacturing process. (10)
   (d) Draw the linear and cyclic structure of silicate. (05)

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B. Sc. Engineering 1st Year 1st Term Regular Examination, 2018

Math 1123

(Mathematics - I)

Full Marks: 210 Time: 3 hrs

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

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Section – A

1. (a) Define limit of a function. What is the distinction between $\lim_{x\to a} f(x)$ and $f(a)$. (12)

A function $f(x)$ is defined as $f(x)=\frac{2x^2-32}{2x-8}$. Does $f(4)$ exist? Explain it. Discuss about the limit of this function at $x=4$.

(b) A function $f(x)$ is defined as follows: $f(x)=\begin{cases} x, when 0<x<1 \\ 2-x, when 1\le x\le 2 \\ 2x-x^2, when x>2 \end{cases}$. Discuss the continuity of $f(x)$ at $x=1$ and differentiability of $f(x)$ at $x=2$. (12)

(c) If $f(x)=\frac{x^3-8x^2+13x-6}{x^2-11x+10}$, find the values of x for which $f'(x)=0$. (11)

2. (a) (i) Differentiate $x^{Sin^{-1}x}$ with respect to $Sin^{-1}x$.

(ii) If $Siny=xSin(a+y)$ then prove that $\frac{dy}{dx}=\frac{Sin^2(a+y)}{Sina}$.

(b) Find y_n, for the function $y=e^{2x}\cos x$. (11)

(c) If $y=Sin^{-1}x$, then by using Leibnitz's theorem prove that $(1-x^2)y_{n+2}-(2n+1)xy_{n+1}-n^2y_n=0$. Also find the value of $(y_n)_0$ when n is even. (12)

3. (a) Define maximum of function. If $\frac{x}{2}+\frac{y}{3}=1$, then find the maximum value of xy and minimum value of x^2+y^2. (13)

(b) Define homogeneous function with an example. If $u=F(x^2+2yz, y^2+2zx)$, then find the value of $(y^2-zx)\frac{\partial u}{\partial x}+(x^2-yz)\frac{\partial u}{\partial y}+(z^2-xy)\frac{\partial u}{\partial z}$. (12)

(c) Evaluate $\lim_{x\to 0} x^{2Sinx}$. (10)

4. (a) State Rolle's theorem. Expand Taylor's series $\frac{1}{x}$ in powers of $(x-\frac{\pi}{2})$. (12)

(b) Given $<A=68^0 40'$, $<B=56^0 20'$ and $c=84^0 30'$ for a spherical triangle ABC. Solve this triangle ABC. (11)

(c) Find the great circle distance between Boston $(42^0 22' N, 71^0 4' W)$ and Wellington $(41^0 8' S, 174^0 46' E)$ in nautical miles. (12)

Section – B

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

(a) $\int xCosxSinxdx$

(b) $\int \frac{x^2+x+1}{\sqrt{(x^2+2x+3)}}dx$

(c) $\int \frac{dx}{4+5Cosx}$

(d) $\int \frac{x^2}{x^4+x^2-2}dx$

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

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

(b) $\int_0^1 \frac{\log(1+x)}{1+x^2}dx$

(c) $\int_0^{\pi/4} \frac{dx}{4+5Sinx}$

(d) $\int_0^{\pi} CosmxCosnxdx$

7. (a) (13)

Define Gamma and Beta functions. Evaluate $\int_0^{\frac{\pi}{2}} Sin^4 xCos^6 xdx$.

(b) Find the area bounded by the parabolas $y^2 = 5x$ and $x^2 = 5y$. (11)

(c) Find the volume of the solid formed by the revolution of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ about x-axis. (11)

8. (a) Define Fourier series. Find the series of sines and cosines of multiples of x which represents $f(x)$ in the interval $-\pi < x < \pi$, where $f(x) = \begin{cases} 0, when -\pi < x \le 0 \\ \frac{\pi x}{4}, when 0 < x < \pi \end{cases}$ and hence deduce (18)

$\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + ...$

(b) If $f(x) = \begin{cases} x, for 0 \le x \le \frac{\pi}{2} \\ \pi - x, for \frac{\pi}{2} < x \le \pi \end{cases}$ express this function by a sine series and also by a cosine series. (17)

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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) What thermo couples would you use to measure a temperature between? (10)
(i) $0^0 - 400^0$C (ii) $400^0 - 800^0$C (iii) $600^0 - 1200^0$C (iv) $1200^0 - 1600^0$C
(v) $1600^0 - 2000^0$C and (vi) $2000^0 - 3000^0$C and why?

(b) Describe a platinum resistance thermometer. Explain how it works with the help of Callendar and Griffth's bridge. Give its correction. (15)

(c) The resistance of a platinum wire at 0^0C, 100^0C and 445^0C are found to be 7.0, 10.5 and 18.5Ω, respectively. The resistance of a wire at a temperature t^0C is given by the equation $R_t = R_o(1+\alpha t+\beta t^2)$. Find the value of α and β. (10)

2. (a) What do you mean by entropy? Prove that the entropy of the universe is always increasing and heading towards a maximum. (10)

(b) What is Carnot's Reversible Engine? Obtain an expression for the efficiency of Carnot's engine in terms of temperature. (15)

(c) A Carnot engine is operated between two reservoirs at temperatures of 450k and 350 k. If the engine receives 1 kcal of heat from the source in each cycle. Calculate: (10)
(i) amount of heat rejected to the sink in each cycle
(ii) efficiency of the engine and
(iii) work done by the engine in each cycle.

3. (a) Discuss the general behavior of material under stress with reference to a stress-strain curve. (10)

(b) What is cantilever? Obtain an expression for the depression at the free end of a thin light beam clamped horizontally at one end load at the other. Neglect the weight of the cantilever. (15)

(c) Calculate the depth of water at which an air bubble of radius 4×10^{-4}m may remain in equilibrium. Surface tension of water = 70×10^{-3} N/m. (10)

4. (a) Show that the excess pressure inside a soap bubble of radius r over the atmospheric pressure outside it is equal to 4T/r, where T is the surface tension of soap solution. (15)

(b) Derive an expression for the rate of flow of heat through a composite slab. (10)
Hence show that the interface temperature $\theta = \dfrac{k_1\theta_1/x_1 + k_2\theta_2/x_2}{k_1/x_1 + k_2/x_2}$ °C

(c) A composite slab is made of two parallel layers of different materials A and B in contact. Their conductivities are 70 W/m/k and 200 W/m/k respectively and thickness 0.045 m and 0.025 m respectively. Find the temperature of the interface of A and B, when their outer surfaces are maintained at 373 K and 273 K respectively. (10)

Section – B

5. (a) Calculate the average kinetic energy and the total energy of a body executing simple harmonic motion. Hence show that, $\langle K.E \rangle = \pi^2 ma^2 n^2$ and $TE = 2\pi^2 ma^2 n^2$; where all the symbols have their usual meanings. (10)

   (b) What is Lissajous figure? The simple harmonic vibration acting at right angles to each other has the time period in the ratio 1:2. The phase difference between the two vibrations is $\pi/2$. Show graphically that the resultant curve is a parabola. (15)

   (c) Two SHM's acting simultaneously on a particle are given by the equations $y_1 = 5 \sin (wt + \pi/6)$ and $y_2 = 7 \sin (wt + \pi/3)$. (10)

   Calculate (i) amplitude (ii) phase constant and (iii) the time period of the resultant vibration.

6. (a) Discuss the phenomenon of sharpness of resonance and show how it depends upon the damping factor? (10)

   (b) Discuss an LCR circuit as an example of a damped harmonic oscillator and show that it is the resistance alone which is responsible for the damping of oscillations. Discuss the conditions under which the discharge of the capacitor is periodic, critically damped and oscillatory. What is the quality factor of such a circuit? (15)

   (c) Deduce the frequency and quality factor for a circuit with L = 3 mH, C = 7μF and R = 0.3 ohm. (10)

7. (a) Show that in the case of stationary wave no energy is transferred. (10)

   (b) What is an echo? How is it produced? Explain, why an echo cannot be heard if the distance between the source of sound and the obstacle is less than 17 meters. Also explain the formation of successive echoes. (15)

   (c) Which of the following are solutions of the one dimensional wave equation? (10)

   (i) $y = x^2 + v^2t^2$; (ii) $y = x^2 - v^2t^2$

8. (a) Discuss the refraction of sound waves at the interface of two media and explain, how most of the sound energy is totally internally reflected when sound waves are travelling from rarer to denser medium. (10)

   (b) Derive an analytical expression for the growth and decay of sound intensity inside an auditorium and hence obtain Sabine's reverberation formula. (15)

   (c) The volume of a room is 600 m^3. The wall area of the room is 220 m^2, the floor area is 120 m^2 and the ceiling area is 120 m^2. The average sound absorption co-efficient, (i) for the wall is 0.03; (ii) for the ceiling is 0.80, and (iii) for the floor is 0.06. (10)

   Calculate the average sound absorption co-efficient and the reverberation time.
