

Sylhet Engineering College, Sylhet
(Shahjalal University of Science & Technology)
Department of Civil Engineering

Final Examination, 2025
Course No.: ENG 0231 1101
Time: 02 (Three) hours

1st Year 1st Semester
Course Title: English-I
Full Marks: 60

- N.B. : (i) Answer all questions from each PART (ii) Use separate answer scripts for each PART
(iii) Marks allotted are indicated in the margin (iv) Special Instruction (if any)-----N/A-----

PART- A

1. **Fill in the blanks with appropriate verbs:** **15**
- a) Neither the students (to be) willing to admit that the project had failed.
 - b) The committee, along with its advisors, (to have) decided to postpone the final decision.
 - c) The number of participants in the workshop (to be) higher than expected.
 - d) To compete with them (be) a challenge for the newbies.
 - e) Politics (to be) often viewed as a dirty game, but the people remain passionate about change.
 - f) The team of engineers, who (works/work) on the AI project.
 - g) If (know) about the traffic jam, she (leave) home yesterday.
 - h) If she (not get) the promotion unless you (show) more initiative and leadership at work.
 - i) If the weather (be) better tomorrow, we (go) for a hike; otherwise, we'll stay indoors and watch a movie.
 - j) If they had information about the meeting,---
2. (a) What is precis writing? **08**
- (b) What are the key ideas and the purpose of precis writing? **07**

OR

What is Non Verbal Communication? What are the advantages and disadvantages of Non Verbal Communication? **15**

PART- B

3. Discuss Anita Desai's treatment of child psychology in her short story "Games at Twilight" **15**
4. Suppose you are a reporter of a national daily. Write a report for the newspaper on recent price hike. **15**

OR

Write an essay on the following topic: **15**

- ❖ Contribution of Technology in Education

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Final Examination, 2025
Course No: PHY 0533 1103
Time: 03 (Three) hours

1st year 1st Semester
Course Title: Physics I
Full Marks: 60

N.B. : (i) Answer all question from each PART
(iii) Marks allotted are indicated in the margin

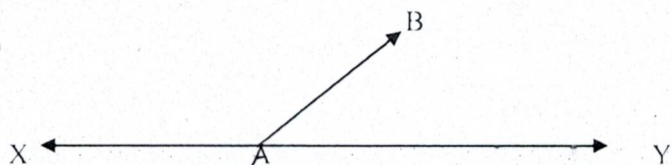
(ii) Use separate answer scripts for each PART
(iv) Special Instruction (if any): N/A

Part-A

1. a) State 1st law of thermodynamics. Apply 1st law of thermodynamics to an isothermal and adiabatic process. 04
 - b) What do you mean by reversible and irreversible process? 02
 - c) State briefly the principles underlying the working of the following thermometers: 04
 - i) Constant volume hydrogen thermometer.
 - ii) Resistance thermometer.
- or
- a) What is heat engine? What are the difference between reversible engine and irreversible engine? 04
 - b) Write the postulates of kinetic theory of gases. 03
 - c) What is efficiency? The efficiency of a Carnot's engine is 30% when the temperature of the sink is 27°C. What must be the change in temperature of the source to make it's Efficiency 50%. 03
2. a) Obtain the equation of maximum intensity from the analytic treatment of interference (with figure) 04
 - b) What is polarization of light? Explain Brewster's law of polarization. 03
 - c) An object of mass $m=0.2\text{kg}$ is hung from spring ($k=80\text{N/m}$), resistive force $-vb$ is exists where $b = 4\text{Nm}^{-1}\text{S}$. Does block oscillate? If yes find T . 03
3. a) What is damped oscillation? Prove that, the frequency of a damped oscillation will be zero or oscillation stop when $b^2 = 4mk$. 4.5
 - b) Write the characteristics of simple harmonic motion. 03
 - c) In an experiment to obtain Lissajous' figures, one tuning fork is of 256 Hz and a circular figure occurs after ten seconds. What deductions may be made about the frequency of the other tuning fork? 2.5

Part-B

4. a) Why Vander Waals corrected the perfect gas equation? 03
 - b) Show that, "the average kinetic energy associated with each degree of freedom is $1/2K^1$ ". 04
 - c) Define specific heat. 30 kg of iron is heated by 3k when 40500 J of energy is added to it. 03
What is the specific heat of iron?
5. a) Write the drawbacks of Huygens's principle? 03
 - b) Let a plane wavefront AB incident on a plane reflecting surface XY. Where will be the secondary wavefront after reflection according to Huygens? Explain your answer. 04



- c) What are Newton's rings? How are they formed? 03
- or
- a) Write briefly corpuscular theory of light. 03
 - b) What do you mean by Fresnel by prism? Explain with figure. 04
 - c) In Young's double slit experiment, the separations between the sources are 0.18mm. The fringes are observed on a screen 90 cm away. If with certain monochromatic source of light, the third bright fringe is situated at a distance of 8.1 mm from the central bright fringes. Find the wave length of light. 03
6. a) What is Doppler effect? 02
 - b) Show that the total energy of a vibrating particle is constant or conserved. 04
 - c) Write Sabine's formula. Discuss the acoustic requirements of a good auditorium. 04

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Final Examination, 2025

1st Year 1st Semester

Course No.: MAT 0541 1103

Course Title: Differential Calculus, Integral Calculus and Matrices

Time: 03 (Three) hours

Full Marks: 60

N.B. : (i) Answer all questions from each PART

(ii) Use separate answer scripts for each PART

(iii) Marks allotted are indicated in the margin

(iv) Special Instruction (if any)-----N/A-----

PART- A

1. (a) Define limit of a function. If $f(x) = \begin{cases} x, & 0 < x < 1 \\ 2 - x, & 1 \leq x \leq 2 \\ x - \frac{x^2}{2}, & x \geq 2 \end{cases}$ 1+5

Then check continuity and differentiability at the point $x = 2$.

- (b) If $f(x,y) = xy \frac{x^2-y^2}{x^2+y^2}$ then find $\frac{\partial^2 f}{\partial x \partial y}$, $\frac{\partial^2 f}{\partial y \partial x}$ 04

OR

- (a) Find nth derivative of the function $\ln(1+2x)$ 02
- (b) If $y = \cos(\sin^{-1} x)$ then show that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (m^2-n^2)y_n = 0$. 03
- (c) Verify Mean value theorem for the function $f(x) = x(x-1)(x-2)$ in the interval $(0, \frac{1}{2})$. 05
2. (a) Verify the mean value theorem for the function $f(x) = x^2 - 3x + 2$ in the interval $[0,2]$ 05
- (b) Define Beta function .Prove that $\beta(m, n) = \frac{\Gamma_m \Gamma_n}{\Gamma(m+n)}$ 05
3. (a) Define linear equation with example .Discuss about types of solution of a system of linear equation. 02
- (b) Solve the following system of linear equations is : 04

$$\begin{aligned} x+y+2z &= 9 \\ 2x+4y-3z &= 1 \\ 3x+6y-5z &= 0 \end{aligned}$$

- (c) Define singular matrix and invertible matrix .Find rank and nullity of the following matrix : 04

$$\begin{bmatrix} 2 & -1 & -3 \\ -2 & 1 & 3 \\ -4 & 2 & 6 \end{bmatrix}$$

PART- B

4. (a) Evaluate : (i) $\int \frac{x^2+x+1}{\sqrt{x^2+2x+3}} dx$ (ii) $\int xe^x \cos x dx$ 4+4

- (b) Define definite integration. Prove that $\int_a^b f(x)dx = \int_a^c f(x)dx + \int_c^b f(x)dx$ 02

OR

- (a) Evaluate : (i) $\int_0^1 \frac{\log(1+x)}{1+x^2} dx$ (ii) $\int_0^\pi \frac{xdx}{a^2 \sin^2 x + b^2 \cos^2 x}$ 3+3

- (b) Find a reduction formula for $\int \tan^n x dx$ and hence find the value of $\int \tan^6 x dx$. 04

5. (a) If n is positive integer then show that $|(n+1) - n!|$ 02

- (b) Prove that $\left| \binom{1}{2} \right| = \sqrt{\pi}$ 03

- (c) Evaluate : (i) $\int_1^\infty \frac{xdx}{(1+x^2)^2}$ (ii) $\int_0^\pi \cos(x+y) dy dx$ 2+3

6. (a) Find the area of the region bounded by the astroid $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ 05

- (b) The circle $x^2 + y^2 = a^2$ revolves round the X-axis .Find the volume of the whole surface. 05

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1st Year 1st Semester

Course No.: HUM 0314/1103

Time: 02 (Two) hours

Final Examination, 2025

Course Title: Sociology

Full Marks: 60

N.B. : (i) Answer all questions from each PART

(ii) Use separate answer scripts for each PART

(iii) Marks allotted are indicated in the margin

(iv) Special Instruction (if any)-----N/A--

PART- A

1. (a) Provide a critical overview of the Malthusian thesis on population growth. 06
- (b) Describe the stages of demographic transition theory. In which stage of demographic transition is Bangladesh currently situated and why? Provide your own arguments. 09
2. (a) Discuss and compare the functionalist, conflict, and interactionist perspectives in sociology with appropriate examples. 09
- (b) How does the study of sociology benefit students of civil engineering? 06

OR

- (a) Describe the social structures of Bangladesh. 06
- (b) How does Herbert Spencer explain social change through his theory of social evolution? Critically analyze this theory. 09

PART- B

3. (a) How does Auguste Comte explain the Law of Three Stages in the development of human thought and society? 09
- (b) What is the Hierarchy of Sciences proposed by Auguste Comte? 06
4. (a) Compare and contrast culture and civilization with appropriate examples. 08
- (b) In what ways does technology influence culture? 07

OR

- (a) Write short notes on the following concepts:

- i. Society 03
- ii. Community 03
- iii. Association 03
- iv. Institution 03
- v. Sociological Imagination 03

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Final Examination, 2025
Course No.: CHE 0531 1101
Time: 03 (Three) hours

1st Year 1st Semester
Course Title: Chemistry I
Full Marks: 60

N.B. : (i) Answer all the questions from each PART (ii) Use separate answer scripts for each PART
(iii) Marks allotted are indicated in the margin (iv) Special Instruction (if any)-----N/A-----

PART-A

1. (a) What is sub-atomic particle? Illustrate the postulates of Bohr's theory for the hydrogen atom that successfully explains the appearance of an emission spectrum. 1+3
- (b) Deduce an expression for the radius of the n^{th} orbit of an electron of hydrogen atom. 4
- (c) If the radius of the first orbit of hydrogen atom is 0.53 \AA , then what will be the de-Broglie wavelength of the electron in the ground state of hydrogen atom? 2
2. (a) Discuss the trends of ionization energy and electron affinity when we move (i) from left to right across the period and (ii) from top to bottom in a group. 4
- (b) State modern periodic law. Modern periodic table of elements is superior to Mendeleef's periodic table. Explain. 1+3
- (c) Draw resonance structures for SO_4^{2-} and assign the formal charges for each atom. 2
3. (a) Explain the followings: 2+2
 - i. CO_2 is a gas while SiO_2 is a very hard solid at room temperature.
 - ii. BeCl_2 contains covalent bond whereas MgCl_2 contains ionic bond.
- (b) State and derive Raoult's law of relative lowering of vapour pressure. 3
- (c) A solution containing 25% water (H_2O), 25% ethanol ($\text{C}_2\text{H}_5\text{OH}$) and 50% ethanoic acid (CH_3COOH). Calculate the mole fraction of ethanol and ethanoic acid. 3

OR

- (a) Explain the followings: 2+2
 - i. PCl_5 exists but NCl_5 does not exist.
 - ii. NH_3 is trigonal pyramidal molecule.
- (b) Define mole fraction and percentage by weight. Between molarity and molality which one is temperature dependent and why? 2+2
- (c) Prepare a 250 ml 2 M HCl solution in which the purity of HCl is 37% and specific gravity is 1.20. 2

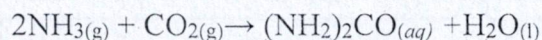
PART-B

4. (a) What is conjugate acid-base pair? What are the conjugate bases of the following acids: H_2CO_3 , H_2O , HClO_4 and HCN ? 1+2
- (b) Derive Henderson's equation for calculating the pH value of a buffer solution. 4
- (c) Calculate the pH of a buffer solution prepared by adding 10mL of 0.1M acetic acid to 20mL of 0.1M sodium acetate. [$K_a=1.75 \times 10^{-5}$] 3

5. (a) Discuss the mechanism of a Galvanic cell by taking Daniel cell as an example. What are the functions of salt bridge in a cell? 3+1

(b) According to Le Chatelier's principle explain the effect of temperature and pressure on the equilibrium of the following reaction: $N_{2(g)} + 3H_{2(g)} \leftrightarrow 2NH_{3(g)}$; $\Delta H = -92 \text{ kJ}$ 3

(c) Urea $[(NH_2)_2CO]$ is prepared by reacting ammonia with carbon dioxide: 3



In one process, 637.2g of NH_3 is treated with 1142g of CO_2 . (i) Which of the two reactants is the limiting reactant? (ii) How much excess reactant (in grams) is left at the end of the reaction?

6. (a) What are conjugate acid-base pairs? Give two examples. 4

(b) Write three methods for determining the strength of acid. 3

(c) Calculate the pH of a 0.2M NaOH solution. 3

OR

(a) Suppose that for the analysis purpose, you need a solution of constant pH. How can you maintain the stability of pH. 4

(b) Water can act both as an acid and base-Explain. 3

(c) Calculate the concentration of sodium formate, $HCOONa$, that must be present in a 0.1 M solution of formic acid to produce a pH of 3.80. $K_a = 1.8 \times 10^{-4}$. 3

Sylhet Engineering College
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Department of Civil Engineering
1st year 1st Semester Final Examination 2025

Course No: CE 0731 1121

Course Title: Surveying

Time: 3 (Three) hours

Full Marks: 60

NB: (i) Answer all questions from each part (ii) Use separate answer script for each part
(iii) Marks allotted indicated in the margin (iv) special instruction (if any)

Part – A

1. a) What is the main principle of surveying? What is the fundamental difference between plane surveying and geodetic surveying? 02
- b) The sides of a triangle are 156, 103 and 257m. Examine whether the triangle is well-conditioned. 03
- c) A steel tape 20m long standardized at 55⁰F with a pull of 10 kg was used for measuring a base line. Find the correction per tape length. If the temp at the time of measurement was 80⁰F and the pull exerted was 16 kg weight of 1 cubic cm of steel= 7.86 g, weight of the tape = 0.8 kg and $E = 2.109 \times 10^6$ kg/cm², coefficient of expansion of tape per 1⁰F = 6.2×10^{-6} . 05
2. a) Write short notes on the following terms 02
I. Remote Sensing (RS)
II. Geographical Information System (GIS)
- b) Mention the land, the air and the marine applications of global positioning system 02
- c) A tacheometer was set up at a station S and the readings on a stadia rod held upon a bench mark A whose R.L. is 110.00, where 3.22, 4.82 and 6.42 and the vertical angle was 4⁰12'. Again the stadia readings at a station B were 2.00, 4.12 and 6.24 and the angle of depression was 7⁰36'. Calculate the horizontal distance between A and B and the R.L. of the station B. Take $f/i=100$ and $f+d=1$. Draw the figure first. 06
3. a) What is local attraction? How would you check the accuracy of open traverse? 02
- b) The FB of a line is 96⁰30' and BB is 276⁰0'. How will you adjust the bearings? 02
- c) Calculate the length and bearing of the line DE of a closed traverse ABCDEA from the following table: 06
- | Line | AB | BC | CD | DE | EA |
|--------|---------------------|----------------------|---------------------|----|----------------------|
| Length | 100' | 142' | 110' | - | 115' |
| WCB/FB | 60 ⁰ 30' | 120 ⁰ 25' | 44 ⁰ 40' | - | 330 ⁰ 10' |

OR

- a) What do you mean by degree of curvature? What will be the length of radius of a 4⁰ curve? 02
- b) What is super elevation? How can you decide the minimum radius of the curve for the vehicle for highways and railways? 02
- c) Calculate the RL of the various station pegs on a vertical curve connecting two grades of +0.6% and -0.6%. The chainage and the RL of Intersection point are 550 and 325.50m respectively. The rate of change of grade is 0.1% per 30m. 06

Part – B

4. a) Define the following: datum surface, line of collimation, reduced level, bench mark 02
- b) In an operation involving reciprocal levelling, two points A and B are taken on opposite banks of river. When the level was set up near A, the staff readings on A and B were 2.245 and 3.375 respectively. When the level was set up on near B, the staff reading were 1.955 and 3.055. Find the true difference of level between A and B. what is the RL of B, if that of A is 125.550? 02
- c) A page of a level book is shown in the following. Fill the missing reading and calculate the RL of all points. Apply the usual checks. 06

| Station | BS | IS | FS | Rise | Fall | RL | Remarks |
|---------|-------|-------|-------|-------|-------|---------|---------|
| 1 | 2.150 | | | | | 450.000 | BM I |
| 2 | 1.645 | | ? | 0.500 | | | |
| 3 | | 2.345 | | | ? | | |
| 4 | ? | | 1.965 | ? | | | |
| 5 | 2.050 | | 1.825 | | 0.400 | | |
| 6 | ? | | ? | ? | | 451.500 | BM II |
| 7 | 1.690 | | 1.570 | 0.120 | | | |
| 8 | 2.865 | | 2.100 | | ? | | |
| | | | ? | ? | | 451.250 | BM III |

5. a) What are the characteristics of contour lines? 03
- b) A man at a position 10m above sea level observes the peak of a hill. The distance between the man and the hill is 80 km. find the height of the hill. 02
- c) The following perpendicular offsets were taken from a chain line to a hedge: 05

| Distance (m) | 0 | 5 | 10 | 15 | 20 | 30 | 40 | 50 | 65 | 80 |
|--------------|------|------|------|------|------|------|------|------|------|------|
| Offset (m) | 3.40 | 4.25 | 2.60 | 3.70 | 2.90 | 1.80 | 3.20 | 4.50 | 3.70 | 2.80 |

Calculate the areas by i) Trapezoidal rule and ii) Simpson's rule

OR

- a) What is two point problem? 02
- b) An excavation is to be made for a reservoir 40m long and 30 m wide at the bottom. The side slope of the excavation has to be 2:1. Calculate the volume of earth work if the depth of excavation is 5 m. assume level ground at the site. 03
- c) A railway embankment of 600m long has a formation level width of 11.5m with side slope of 2:1. If the ground and formation level are as follows, calculate the volume of earth work. The ground is level across the center line. 05

| Distance (m) | 0 | 100 | 200 | 300 | 400 | 500 | 600 |
|--------------|-------|-------|-------|-------|-------|-------|-------|
| GL (m) | 105.2 | 106.8 | 107 | 103.4 | 105.6 | 104.7 | 105.1 |
| FL (m) | 107.5 | 108.6 | 108.5 | 104.5 | 106.9 | 105.6 | 106.3 |

6. a) What do you mean by degree of curvature? Derive relation between radius and degrees of curvature. 02
- b) Two straight lines AC and CB, to be connected by a 3⁰ curve, intersect at a chainage of 2760 m. The deflection angle is 30⁰ calculate all necessary data for setting out the curve by any suitable method. 04
- c) Calculate the RL of the various station pegs on a vertical curve connecting two grades of +0.6% and -0.6%. The chainage and the RL of intersection point are 550 and 325.50 m respectively. The rate of change of grade is 0.1% per 30m. 04